Scanning - Shortwave - Ham Radio - Equipment
Internet Streaming - Computers - Antique Radio

Monitoring Times®

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August 2010

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Uniden's HomePatrol™ is HERE!

TV DX
BETTER THAN EVER!

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In this issue:

- Build Your Own Retro AM Receiver
- History of Radio Club of America
- MT Reviews: Icom IC-R6

AR5001D Wide Coverage Professional Grade Communications Receiver

The Legend Lives On!

The AR5001D delivers amazing performance in terms of accuracy, sensitivity and speed.

Available in both professional and consumer versions, the AR5001D features wide frequency coverage from 40 KHz to 3.15 GHz, with no interruptions. Developed to meet the monitoring needs of security professionals and government agencies, the AR5001D can be controlled through a PC running Windows XP or higher. Up to three channels can be monitored simultaneously. Fast Fourier Transform algorithms provide a very fast and high level of signal processing, allowing the receiver to scan through large frequency segments quickly and accurately. AR5001D standard features include storage of up to 2000 frequencies, 45 MHz IF digital signal processing, direct digital sampling, a high performance analog RF front-end, a DDS local oscillator and advanced signal detection capabilities which can detect hidden transmitters. With its popular analog signal meter and large easy-to-read digital spectrum display, the AR5001D is destined to become the choice of federal, state and local law enforcement agencies, the military, emergency managers, diplomatic service, news-gathering operations, and home monitoring enthusiasts.*

Discover the next generation in AOR's legendary line of professional grade desktop communications receivers.

- Multimode receives AM, wide and narrow FM, upper and lower sideband and CW
- Up to 2000 alphanumeric memories (50 channels X 40 banks) can be stored
- Analog S-meter
- Fast Fourier Transform algorithms
- Operated by a Windows XP or higher computer through a USB interface using a provided software package that controls all of the receiver's functions
- An SD memory card port can be used to store recorded audio
- Analog composite video output connector
- CTCSS and DCS squelch operation
- Two selectable Type N antenna input ports
- Adjustable analog 45 MHz IF output with 15 MHz bandwidth
- Triple-conversion receiver exhibits excellent sensitivity
- Powered by 12 volts DC (AC Adapter included), it can be operated as a base or mobile unit
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Add to the capabilities of the AR5001D with options:

- Optional APCO-25 decoder
- Optional LAN interface unit enables control via the internet
- Optional I/Q output port allows capture of up to 1 MHz onto a computer hard drive or external storage device
- Optional AR-I/Q Windows software facilitates the easy storage and playback of transmissions captured within the selected spectrum in conventional modes, or, signals can be subjected to further analysis
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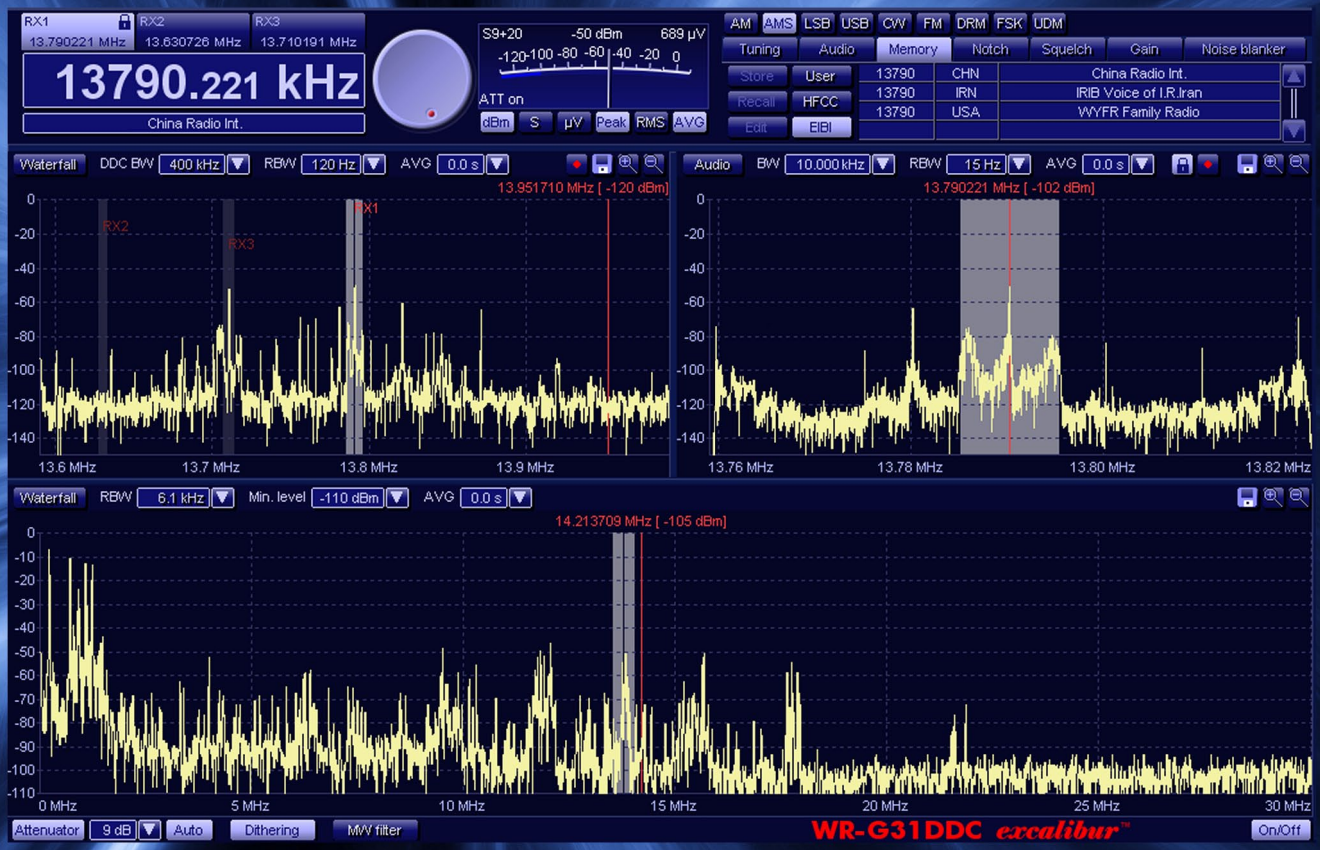

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- **16-bit 100 MSPS A/D converter**
- **50 MHz-wide, real-time spectrum analyzer**
- **2 MHz recording and processing bandwidth**
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- **Audio spectrum analyzer**
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- **Very high IP3 (+31 dBm)**
- **Excellent sensitivity (0.35 µV SSB)**
- **Excellent dynamic range (107 dB)**
- **Selectable medium-wave filter**
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Receive three stations simultaneously, record with 2 MHz bandwidth, see the entire shortwave spectrum live - all of this at the same time. Which other receiver can do that? For more details, see:

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Monitoring Times

Vol. 29 No. 8 August 2010

TV DX: 8
Better than Ever!
By Danny Oglethorpe

You might have thought that converting the TV band from analog to digital would be the end of TV DXing, but it's not. In fact, as Danny Oglethorpe writes, it's better than ever. Reception of analog stations from Canada, Mexico, Central America, the Caribbean, and even South America, that used to be buried by powerful local analog TV stations, are now possible.

In addition, many U. S. low-power analog TV stations, still allowed on the air, that had been buried by local TV stations, are now DX catches. And, thanks to the mystery of seasonal VHF and UHF propagation, digital TV signals from 300, 500, even 1,200 miles away are possible with the added feature of being ID'ed instantly by today's DTV sets.

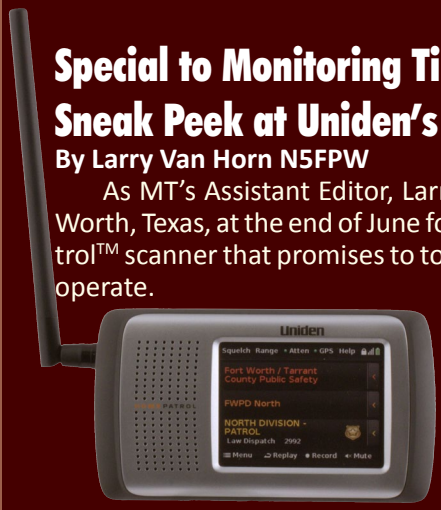
Danny shows MT readers that TV DX is not only easy, but it's one of the least expensive bands to monitor, with even modest set-ups bringing in impressive results.

I hope you didn't throw out all of your analog TV sets following last year's DTV switch. If you didn't, you can still take advantage of this summer's TV DX season. If you did, you'd better get over to the nearest junk shop and buy one! Hint: They're really cheap!

On Our Cover

TV DXer's dream: This sixty foot tall CATV tower brings in distant TV channels for a local cable-TV system. (Photo by Don Edwards). Inset TV screen shots from XHAJ-TV Vera Cruz, Mexico; Global TV Thunder Bay, Canada; CKVR-TV Barrie, Ontario, Canada; XEWO-TV Guadalajara, Mexico, HRCV Tegucigalpa, Honduras, all received from the author's home in Louisiana. (Courtesy: Danny Oglethorpe)

C O N T E N T S



R E V I E W S

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AR-ALPHA

Communications Receiver

- Multi-mode unit capable of receiving AM (synchronous), ISB, RZ-SSB, USB, LSB, CW, WFM including FM stereo, NFM, APCO-25 digital, and TV in both NTSC and PAL formats
- 6-inch TFT color panel can display received video signals or depict spectrum activity over a wide choice of bandwidths including a "waterfall" function to show signal activity over a specified time period

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AOR proudly introduces the AR-ALPHA, the first in a new class of professional monitoring receivers! Designed to cover 10KHz to 3.3GHz, with no interruptions,* this receiver features a 6-inch color TFT display, five VFOs, 2000 alphanumeric memories that can be computer programmed as 40 banks of 50 channels, 40 search banks, a "select memory" bank of 100 frequencies, and a user designated priority channel. It includes APCO-25 digital and a DVR with six channels that can record up to a total of 52 minutes audio. Monitoring professionals will appreciate the world class engineering and attention to detail that makes the AR-ALPHA such an amazing instrument.

- Composite video output on the rear panel of the unit
- Selectable IF bandwidths:200 Hz, 500 Hz, 1 KHz, 3 KHz, 6 KHz, 15 KHz, 30 KHz, 100 KHz, 200 KHz and 300 KHz along with the ability to shift the IF.
- CTCSS and DCS selectable squelch functions
- DTMF tone decode
- Built-in voice-inversion descrambling
- CW pitch control, AGC, AFC
- Auto-notch feature
- User selectable spectrum display function from 250 KHz through 10 MHz in 1 KHz increments. Above 10 MHz bandwidth, it can display 20 MHz, 50 MHz, 100 MHz or 1 GHz, but above 20 MHz bandwidth, no audio will be available
- Resolution bandwidth is also user-selectable in increments of 1 KHz, 4 KHz, 32 KHz, 64 KHz, and 128 KHz.
- Fast Fourier Transform (FFT)
- Rear panel connections include 12 VDC power, RS-232C, USB 2.0, I/Q output with 1 MHz bandwidth, two antenna ports (one SO-239 and one Type N) and up to four antennas may be selected through the receiver's controls with the optional AS5000 antenna relay selector.
- Use desktop or with 19" rack mount

The AR-ALPHA redefines excellence in professional monitoring receivers. No wonder so many monitoring professionals including government, newsrooms, laboratories, military users and more, rely on AOR.

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COMMUNICATIONS

by Ken Reitz

AMATEUR RADIO/SHORTWAVE

ZL Op Caught with Way Too Much Power

The New Zealand Ministry of Economic Development released a statement on May 25 noting that its Radio Spectrum Management, that country's version of the FCC, had prosecuted a New Zealand ham for "transmitting outside the terms and conditions of the General user Radio License for Amateur Radio Operators." The crime? Going QRO (high power) on the HF bands with no less than 3,100 watts. According to NZART (New Zealand Association of Radio Transmitters), New Zealand hams are limited to 500 watts PEP on HF.

So, was he sniffed out by FCC-style band police using sophisticated direction finding techniques and spectrum analyzers? No, actually they were alerted when they saw the ham's video on *You Tube* showing the transmitter operating at 3,100 watts. The fine was $1,750 plus $130 court costs and they took away his monster transmitter.

ZS Op: Threat to U.S. Security?

A cat-loving, retired grandfather in suburban Cape Town, South Africa belongs to a group labeled by the U.S. Congress as a threat to national security. Is he part of another nefarious group plotting heinous deeds of destruction? No, he's a retired professional astronomer with degrees in physics and chemistry and, well, uh…he's a ham.

According to an article in the Sunday Cape Town *Times*, he and like-minded amateur astronomer/hams had wanted to know the whereabouts of the recently launched and mysterious X-37B shuttle-looking, pilotless satellite mentioned in last month's *Communications* column. Not only were they able to spot the Air Force satellite, but calculating its orbit (about 92 minutes) and speed (8 km/sec) was child's play. And, with his homemade telescope he was also able to record footage of the not-so-secret craft.

The feat earned the 70 year-old a mention in the New York *Times,* which also noted that the amateur team discovered that the satellite moves as far as 40 degrees north latitude to 40 degrees south, placing it over Afghanistan, Iraq and (surprise!) North Korea every four days.

10 Year-old Boy Works Satellite, Amazes Friends

It's commonly believed that kids today are only interested in video games and downloading music for free. But it's not so, as an article in the May 18 Oneonta (NY) *Daily Star* shows. One kid, a 10 year-old boy and licensed ham, is shown (with his dad) demonstrating how to work the easy-sats using a hand-held amateur satellite antenna and an H-T. The pictures that go along with the piece show a very interested group of kids who were just waiting for someone to show them something cool that they could do with just a little study and help from a friend or family member.

BBC Notes Shift in Listener Habits

On June 8 the BBC issued a press release detailing the effective reach of their online, satellite and over-the-air signal, claiming to reach some 241 million people in a record global weekly audience. That was the lead paragraph in the release. The very next paragraph said, "…BBC World Service lost 20 million shortwave radio listeners during the year; reflecting the increasing global decline of the medium." The release noted particularly steep losses in Bangladesh, India and Nigeria. World Service gains in Tanzania and the U.S. were put up to relays of BBC programming on local AM and FM outlets.

AM/FM/TV BROADCASTING

FCC Warrantless Searches on Part 15 Devices Questioned

Through a Freedom of Information Act (FOIA) request, the Electronic Frontier Foundation (EFF), a public advocacy group working for government transparency, questions the FCC's claim of authority to conduct warrantless searches. Among the documents EFF has forced the FCC to disclose are "materials intended to instruct FCC agents how to obtain consent to enter a home" as well as "the consequences of withholding consent from an FCC agent to conduct an inspection of a Part 15 Device in a residence."

The EFF also announced the addition of thousands of government records and documents relating to a wide range of federal oversight issues, the result of over a dozen lawsuits and FOIA requests. FCC related documents and more are found at **www.eff.org**.

HD-Radio to add Traffic Info

According to an article in *GPS Business News*, Clear Channel Radio's traffic service known as Total Traffic Network is developing a local traffic report to be delivered via HD-Radio. The service will provide real-time traffic flow on roads covering all U.S. major metro areas and their connecting highways. The service hopes to provide current and forecast traffic conditions in those cities. It also hopes to provide "near real-time pricing and availability of fuel from over 110,000 gas stations" across the U.S.

But, the service will only be available on HD-Radio receivers equipped to decode the data, which so far includes only the audio manufacturer JVC.

INTERNET BROADCASTING

AT&T Looks to Limits

Under the guise of helping consumers make the best choice for Smartphone service, AT&T announced in early June a series of new pricing schemes designed to price service according to bandwidth usage and doing away with their flat-rate plan.

Starting with a $15/month entry plan, dubbed "DataPlus," customers are allowed 200 MB of data (space enough to send/receive 150 emails with attachments and view 400 web pages per month). If DataPlus customers exceed that amount, an additional 200 MB will be added

Apple iPhone 4 (Courtesy: Apple)

for an extra $15.

The DataPro service costs $25/month and allows 2 GB of data with an additional GB available for $10 per month. Those who currently have the unlimited plan for $30/month can keep it forever, as long as they never change plans. If a subscriber does switch to one of the other plans, they cannot go back to the unlimited plan. AT&T is no longer offering the unlimited plan to new subscribers, however, those currently on the plan are grandfathered in.According to AT&T, 2 GB is enough bandwidth for 1,500 emails with attachments/month, plus viewing 4,000 web pages, post 500 photos to social media sites, and watch 200 minutes of streaming video. But wait, there's more! Smartphone users get unlimited access at any one of the 20,000 AT&T WiFi hot spots in the U.S.

Don't worry, AT&T won't let you go over your contract amount. If you do, you'll get a free text message advising of that fact and the extra charges.

State-of-the-art two way police radio from 1939 (Courtesy: Motorola)

PUBLIC SERVICE

Scanner Apps vs Criminals

Since the very first radio capable of tuning in the police band was sold (in the 1920s), police have debated the value of the public's ability to listen. Fast forward nearly a century and the technology has changed, but not the debate. Under the dubious headline "Criminals can Monitor iPhone Police Scanner Apps," WUSA, channel 9 in Washington, D.C., apparently woke up late to the reality of scanner applications for the iPhone.

In the story, a policewoman from D.C. shrugged off the scary headline saying, "We always wish the bad guys weren't listening but, that's just not the reality." She did allow that when citizens get the latest information available, they may actually be able to help.

SATELLITE

FCC Gift: 25 MHz from SDARS to Mobile TV

On May 20 the FCC announced it would take 25 MHz of spectrum from the 2.3 GHz frequency band, which had been the exclusive domain for Satellite Digital Audio Radio Service (SDARS), known to us as the monopoly Sirius/XM, and awarded it to the Wireless Communications Service which is the brave new frontier for mobile and portable broadband devices.

The news was not well received by Sirius/XM which immediately decried the potential interference to its vast network of some 800 terrestrially based repeaters (that's how you're able to receive satellite radio signals in buildings). Even though Sirius/XM's repeaters operate at the 2 kW level, so would the transmitters for the new services.

Philly Councilman Tired of Looking at Dishes

A brief article in the Philadelphia *Inquirer* notes that a Philadelphia councilman has a bill before the council to require landlords to locate satellite dishes to the side or rear of a building or apply for certification from the city indicating that the front of the building is the only location possible for satellite reception. The councilman claims that Philadelphians are "…tired of staring at cumbersome satellite equipment on roofs."

FCC ACTION

Crack-down on FM Pirates

June was a very active month for FCC field agents in the Enforcement Bureau. New York took the biggest hit, netting 11 stations issued Notices of Unlicensed Operation (NOUO). Taking advantage of Florida's poor economy, FM pirates were found to be using a vacant condominium building in Miami to house their station. The FCC got the property manager to disable the station and, through investigation, determined who was behind the station's operation and issued an NOUO.

Office of Inspector General

Another station was found to be transmitting from the roof of the Hilton Hotel in downtown Miami. It's not clear who was operating the station, but the hotel was sent the NOUO. Two other FM pirate stations based in Miami were also issued Notices. A station in nearby Sunrise, Florida was found to be operating from the roof of a commercial building. The tenant leasing that space was sent the NOUO. Another in Ft. Lauderdale was also hit with a Notice.

Meanwhile, three pirate FM stations in Colorado – two in Boulder and one in Craig – were issued Notices, as were operators of two unlicensed FM stations in Philadelphia and one in Massachusetts.

Two individuals appear to have been issued NOUOs for the same transmitter in San Jose, California. Field agents reported the station was broadcasting a whopping 777,393 microvolts/meter at 594 meters and that spurious signals from this transmitter were found on the aircraft band.

That was an impressive transmitter, but nothing compared to this month's QRO pirate FM station award, which goes to a Watsonville, California man operating an unlicensed FM station on 101.1 MHz in Santa Cruz, California. FCC field agents measured the output of this transmitter at an astounding 1.29 *million* microvolts/meter at 280 meters. The maximum allowed under Part 15 rules is 250 microvolts/meter at 3 meters.

And, last but not least, a liquor store in Alabama was issued an NOUO for apparently operating an illegal cell phone jamming device, and one person from New Jersey was caught on the New Jersey turnpike operating a GPS jamming device.

Another Former Pirate Goes Legit

As reported earlier this year, an FM pirate operator in Erie, Pennsylvania, who was shut down by a visit from the FCC, has decided to go legit with a legal Part 15 AM station operating on 1700 kHz. According to an article in the Erie *Times-News*, his battle to provide a different format from the corporate voices now on the dial continues.

CELL FONE FOLLIES

Quick-Thinking Teen Aids Capture

WRAL-TV, Raleigh, North Carolina, reported a story about a teen-aged girl, at home alone after school, who, when she heard someone breaking into the house, hid in the bathroom. Working quickly, the burglar allegedly stole some guns and fled the scene, but not before the quick-thinking teen had snapped a photo of the man's car with her cell phone from the window of the bathroom. She called her mom who notified the police who, armed with the photo and a description, soon had the suspect in custody under a $15,000 bond.

Ringing Stolen Phone

According to an article in the Richmond (VA) *Times-Dispatch*, an officer, turning in seized evidence from an earlier stolen car caper, answered a cell phone that was part of the evidence haul when it started ringing. It turns out the person calling was reporting the theft of that phone from the previous night. After investigating the details of the victim's report, the unlucky car thieves are expected to be hit with additional charges.

Imbecile Bank Robber Caught

A report in the Lakeland (FL) *Ledger* told of the arrest of a man suspected of being part of a duo involved in a local bank robbery. When police searched the suspect's car and found his cell phone, they noticed it had photos of the suspect wearing the same ski mask that witnesses had earlier described and – get this – holding a large amount of cash.

"Communications" is compiled by Ken Reitz KS4ZR (kenreitz@monitoringtimes.com) from news clippings and links supplied by our readers. Many thanks to this month's fine reporters: Anonymous, Rachel Baughn, Roy Berger, Bob Grove, Norman Hill, Eric Hopkins, Steve Karnes, Bob Margolis, John Schmelzer, Larry Van Horn

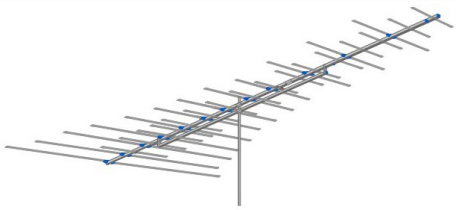
TV DX: Better than Ever!

By Danny Oglethorpe

Five years ago, I purchased a new TV DX tool, a digital TV converter, and connected it to an ordinary analog TV set. From a DX point of view, the gadget had magical power. This small box could turn over-the-air (OTA) digital TV (DTV) snow into station identification (ID) data and video. The summer TV DX season was underway, and I was eager to test this new tool.

A DTV signal looks a little different than the regular snow you used to see on empty analog TV channels, it shows up as bright, long-grained snow on an analog TV set. Even as early as 2005, most veteran TV DXers had plenty of experience watching DTV snow mixed with, and sometimes totally covering, analog TV DX.

On a warm May night in Louisiana, I watched as snow began to cover an OTA analog DX signal from KNAZ-TV, Channel 2, in Flagstaff, Arizona. The snow was evidence that a DTV station from a faraway place was trying to take control of channel 2. The converter's on-screen signal meter also indicated the presence of a DTV signal.



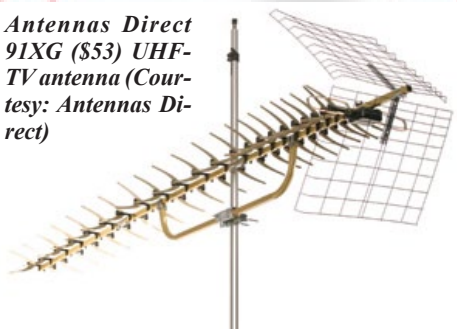
DX VHF-TV/FM antenna from AntennaCraft ($70) comes with 50' coax cable. (Courtesy: Summit Source.com)

Shortly after making a small adjustment to the antenna rotator, this text message appeared on-screen: "3-1 KVBC-DT." That was an instant ID from KVBC-DT, Channel 2, in Las Vegas, Nevada, at a distance of 1,238 miles! How often does a DXer receive an ID so quickly and effortlessly? My new DTV receiver had done its job, and I moved into the new era of TV DXing. (To see pictures of the KVBC-DT reception process, go to **www.tvdxtips.com/kvbc2.html**.)

TV DXing in the 21st Century provides exciting new logging opportunities. Reception of analog and digital TV stations at very long distances is common.

DTV DX Basics

Federal legislation that was passed in the 1990s ordered OTA TV stations in the United States to convert to DTV. All analog TV stations (except low-power ones) were required



Antennas Direct 91XG ($53) UHF-TV antenna (Courtesy: Antennas Direct)

to build a DTV station on a second separate channel. Therefore, TV broadcasters operated transmitters on two different channels during the decade-long analog-to-DTV transition period. Full-power analog TV broadcasting in the United States ended in June 2009.

But other countries continue to operate analog stations and make excellent DXTV targets. Canada will shut down analog TV in 2011, while Mexico plans to keep analog TV until at least 2020. Most countries in Central America and the Caribbean will likely retain analog TV stations for several more years.

Winegard HD5030 ($58) VHF-TV antenna (Courtesy: Winegard)

One major difference between analog TV and DTV is the signal strength threshold required in order for a DTV signal to decode (produce video and ID data). With DTV, there is either an almost-perfect picture or there is no picture at all. There is no such thing as an in-between picture. Analog DX signals, on the other hand, are usually imperfect, with the presence of snow,

Author's TVDX antennas: a Winegard VHF antenna (left) and a Channel Master 8-Bay UHF antenna (right). The UHF antenna is connected to a Winegard preamp. Both are on rotators. (Courtesy: Author)

fading, and co-channel interference from other TV stations. In other words, weak analog signals can produce good enough video and audio to see and hear ID material, while weak digital signals cannot.

Another difference is that many DTV stations have a main channel and additional sub-channels. All sub-channels are received when a DTV decodes the data. DXers, however, count only the main channel in their log.

The instant ID has made DTV popular with many new TV DXers. At the same time, DTV stations bring new logging opportunities to long-time TV DXers who have received many stations and are finding it difficult to log new ones. But now, in addition to full-power DTV stations, the number of low-power DTV stations (LDTV) is growing. In spite of their low power, LDTVs have been logged by DXers at amazingly long distances.

One of the most confusing aspects of DTV is the difference in radio frequency (RF) channels and virtual channels. Through a process known as remapping, virtual channel numbers are listed on the data IDs which are displayed on-screen by converters and high definition TV (HDTV) sets. Those are the old channel numbers on which analog stations transmitted in the past. For example, analog KDFW-TV ("Fox 4") transmitted on channel 4 for many years. Therefore, channel 4 is now the virtual channel for KDFW. The RF channel is the actual channel where the DTV signal is currently transmitted. KDFW-DT's RF channel is 35, and that channel is the important one for DXers.

TV DX Propagation Modes

Propagation is the means by which radio and TV signals travel long distances. Unlike shortwave, where DX signals are always available, or AM radio, where DX is available every night, TV DX cannot be received at just any time. Certain naturally-occurring events must take place in order for TV signals to extend outside of normal coverage areas. Both TV and FM radio DX are caused by the same type of propagation. Another thing worth remembering is that TV DX, regardless of which propagation mode is involved, will generally be from one direction, rather than all directions.

Tropospheric Bending

Tropospheric bending (known to TVDXers as "tropo") is the most common mode, and it can enhance signals on all VHF and UHF TV channels. Weather conditions, including fronts and

XHAJ-TV, Channel 5, in Veracruz, as received via tropospheric bending in 2010. This picture is from a promotion for the five-hundredth anniversary of Veracruz. Distance is 911 miles. (Courtesy: Author)

high barometric pressure, can cause TV signals to travel many times the normal distance. It is common for DXers to receive analog TV and DTV signals in the 200 to 400 mile range by tropo. Distances over 500 miles are less common, but they are possible. Spring and fall are the best times of year for tropo in most parts of the country, but tropo openings can be expected year-round in states near the Gulf of Mexico. Look for tropo at night and early morning. Although tropo is rare between 10 a.m. and dark, it can last all night and begin again the next night.

Jeff Kruszka, a DXer in Houston, Texas, has received DTV DX at some exceptionally long distances via tropo. See some of Jeff's impressive DTV DX here: **www.wtfda.info/showthread.php?t=4309**

My first DTV log from Mexico was XHAB-DT, Matamoros, Tamaulipas, at 505 miles via tropospheric bending. (Courtesy: Author)

May of 1998 will long be remembered by DXers throughout the Gulf Coast states because it was at this time that large forest fires raged out of control in Central America, and the smoke from those fires spread northward. In fact, the sight and smell of smoke was in the air even here in Louisiana. While that was going on, DXers were setting new records via tropo. I logged stations more than 900 miles away during that DX event which have never been received here again.

One day, during that spectacular tropo event, interference from a TV station in Mexico was ruining the picture of my local Channel 12 during the noon newscast. That evening, my local station ran a report about viewers in outlying areas complaining of reception problems. A station engineer blamed the problems on "sunspots." Sunspots, in reality, have no connection with tropo.

According to William Hepburn, a meteorologist and DX propagation authority in Grimsby, Ontario, there was a real connection between the smoke and the DX. The same conditions which produced the tropo enabled the smoke to travel long distances.

Sporadic E-skip

Although the causes of sporadic E-skip (Es) are not really known, we do know that it takes place outside of our troposphere. Parts of the "E" layer of the ionosphere become ionized, thus allowing analog TV and DTV signals to bounce back to earth. Es generally works only on channels 2 thru 6, with signals first appearing on channel 2. The average distance for Es is about 900-1,100 miles, while distances shorter than 600 miles are unusual. Pictures can be extremely strong, but ghosting and rapid jerking are common.

This continuous text ID was a common catch for DXers in 2010. K02NT in Scottsbluff, Nebraska, is a 1.38kW low-power station. Distance at my location is 850 miles via E-skip. (Courtesy: Author)

Although the maximum distance is about 1,500 miles, signals sometimes make a second bounce and travel over 2,000 miles total. That is known as double-hop skip. Es is most-likely to occur between May and August, with a secondary season in December and January. The best time to check for this mode is from about 9 a.m. to 9 p.m., and you can expect some skip openings to last all day. There is no reliable way to predict when Es will occur.

One of my best Es logs is of very short skip. Analog KBEJ-TV, Channel 2 in Fredericksburg, Texas, was received at the unusually short distance of only 327 miles in 2005. KBEJ was a common catch by tropo; but seeing their test pattern in the middle of the day, mixed in a jumble of Es from Mexico and New Mexico, took me by surprise for more than one reason. It was too late in the day for tropo to develop, and KBEJ's picture was behaving like typical Es (it was strong, with ghosting and rapid jerks). While seeing a test pattern at noon did not make any sense, the call letters at the top of the screen gave me positive identification. After emailing KBEJ, a station engineer informed me that the test pattern was up because KBEJ was having technical problems at the time of my reception.

The TVT logo upper right is an example of a logo in a corner of the screen. Many stations in Latin America run a small version of their logo throughout programs. TVT is XEWO-TV, Channel 2, Guadalajara. The distance is 1,002 miles via E-skip. (Courtesy: Author)

Meteor Scatter

Meteor scatter (MS) occurs mostly during the night and particularly early in the morning during those times of year when meteor showers are taking place. This mode produces short bursts of video and audio, most of which are only a few seconds in length. A couple of DXers have received DTV signals via MS and, because of the instant ID feature of DTV, MS TV DX is now easier than ever to ID. If you want to try MS reception this year, your best bet is during the Perseids (night of August 12), Orionids (night of October 21), Leonids (night of November 17) and Geminids (night of December 13).

It is possible to receive TV stations in the 300 to 1,000 mile range via all three propagation modes, but not at the same time. I have logged only seven analog stations by all three. Various Internet sources keep track of real-time DX activity and carry reports from DXers (see details at the end of this article). Using a scanner or communications receiver to monitor the six meter amateur radio band (located just below channel 2) can also alert you to Es which will hit the six meter band before it reaches channel 2.

TV DX in 2010

After the analog TV shut down last year, most DXers were rewarded with newly opened channels in the low-band (channels 2 thru 6). Due to higher levels of electrical and other types of manmade interference on channels 2 thru 6, only three-dozen full-power DTV stations are located below channel 7. One of the unexpected benefits of the open channels for DXers in southern Ontario and the northeastern United States has been the amazing ability to receive analog TV double-hop Es from Mexico, the Caribbean, and Central America. William Hepburn's outstanding 2,200 mile reception of Venezuela TV can be seen here: **www.wtfda.org**.

With the exception of Mexico, TV stations in Latin America seldom show call letters or locations on the air. The way to identify DX from those locations is generally by a logo and/or station name, which is generally displayed in a corner of the TV screen throughout programs.

Independent, non-network stations in Mexico also display names and/or logos in a

This 3kW station in Chicago simulcasts audio with an FM radio station. WLFM-LP, Channel 6, was received via E-skip at 735 miles. (Courtesy: Author)

screen corner. Most TV stations in Mexico, however, are merely relays of national networks based in Mexico City. Many of the larger market relays do run a few local commercials and small "text" IDs. The text IDs contain call letters and transmitter location, and appear at thirty minute intervals in a corner of the screen, though usually not on-the-hour or half-hour.

Many analog TV stations in Canada relay big city network affiliates. Although the number of Canadian stations that use call letters on the air is decreasing, many stations continue to run local commercials and use unique names and logos.

Telesistema is an example of a station name in Central America. This is 1,330 mile E-skip from HRCV-TV, Channel 3, Honduras. (Courtesy: Author)

Another interesting DX opportunity resulting from the analog shutdown is the long-distance reception via Es and tropo of low-power analog TV stations (LPTVs) on channels previously occupied by full-power stations. Until the switchover, low-power TV signals were generally buried under signals from high-powered stations. As mentioned earlier, it is also common to receive DTV stations via Es and tropo at very long distances.

TV DX Equipment

Compared to many electronics hobbies, TV DXing can be relatively inexpensive. The basic tools are an analog TV, a DTV converter box, and an antenna. Some TV DXers, on the other hand, have elaborate set-ups with top-of-the-line communications receivers for listening to analog TV audio and for precise frequency measurement; large, expensive antennas on tall towers; and computer hardware and software that makes it possible to watch, record, and photograph TV DX on their computers. Nonetheless, a newcomer to this hobby can receive a good amount of interesting DX using only basic equipment.

An older model analog TV set will usually work best. It is almost impossible to do analog DXing on a TV which has a weak signal mute. Weak signals will cause the screen to appear blue or black on TV sets with a mute feature. Many TV sets produced in the 1990s and earlier work well for DX. It is common for TV DXers to shop for TV sets at flea markets, garage sales, and eBay.

Few DXers use digital or High Definition TV sets. A converter box connected to an analog TV set works best for DXing. If you are only interested in DTV (and not analog DX), it does not matter if the TV set has a mute; the signals from the converter will be strong and clear. Converters are available from internet retailers and Radio Shack.

All-channel TV antennas work well for many DXers. However, separate antennas for VHF and UHF generally work better. The Winegard HD-5030 is one of the best VHF-only antennas currently available, while the Antennas Direct 91XG is popular for UHF. A good rule of thumb is this: A larger antenna is more directional and pulls in more signal than a smaller one; and an antenna at a higher elevation pulls in more signal than a lower one.

Also, keep in mind that a DX signal is much weaker than a local-grade signal. Therefore, signal loss needs to be kept to a minimum. Low-loss RG-6 and RG-11 coaxial cable work well for connecting an antenna to a TV set. An antenna rotator can aim your antenna in the direction of the DX. Rotators are commonly available at hardware stores and from Internet retailers. A number of TV DXers, however, prefer heavy duty, amateur radio rotators, especially if they are using stacked arrays or multiple antennas on the same mast.

A pre-amp is a signal amplifier that is connected directly to an antenna, increasing the amount of signal that reaches the TV set. It can be especially useful in working with UHF. Most of the preamps used by TV DXers are made by Channel Master and Winegard.

Recording and Photographing TV DX

TV DXers record their DX on a video cassette recorder (VCR), camcorder, or digital video recorder (DVR) for two reasons. First, the recording is proof of reception. Second, DXers often need to review DX in order to read difficult-to-see ID material. However, some VCRs and DVRs will not record DX well. In addition, very weak DX is difficult to record on anything except a camcorder, the camcorder records what is actually on the TV screen. As with purchasing analog TV sets, a garage sale or thrift shop could be the best place to shop for a VCR.

After recording your DX, the next step is to photograph it. Some cameras have a tendency to ruin DX pictures by putting dark bars on the photographs. If your camera can be adjusted so as to avoid the bars, set the shutter speed to one-fifteenth or one-thirtieth of a second. It is also possible to photograph DX live off of the screen. Another common photographic technique is to use the screen capture feature of a TV tuner card in a computer.

The 2010 Season

The 2010 TV DX season has been exciting. DXers have received 2,000 mile double-hop Es, analog LPTVs via Es, and digital TV via Es. As for me, the highlights of the season have been reception of analog TV from 900 miles away via tropo and my first DTV logging from Mexico.

TV DX RESOURCES

- For more information about propagation, equipment (including product reviews), and all aspects of TV DXing, visit the Worldwide TV/FM DX Association's (WTFDA) site. This site also provides information about WTFDA's real-time TV/FM DX message board and WTFDA Forums: **www.wtfda.org** (WTFDA, P.O. Box 501, Somersville, CT 06072). Free samples of the publication *VHF-UHF Digest,* the official publication of the WTFDA are offered on their web site here: **www.wtfda.info/showthread.php?t=966** click on the third attached file listed for the most recent edition.
- Accurate station data, including transmitter coordinates and power: **www.w9wi.com**
- Mexico and Latin America TV DX tips and logos (from the author): **www.tvdxtips.com**
- Accurate forecasts of tropo conditions: **www.dxinfocentre.com/tropo.html**
- Real-time DX maps: **www.vhfdx.net/spots/map.php?Lan=E&Frec=50&Map=NA&mycall=&myl oc=&freq=&prop=**
- Real-time TV DX alerts and reports: **www.dxworld.com/tvfmlog.html**
- Find the distance between two cities anywhere in the world: **www.indo.com/distance**
- TV DX photographs from Jeff Kadet (K1MOD), North America's premier TV DXer: **www.oldtvguides.com/DXPhotos/**
- **VHF-UHF-TV antennas and accessories** are available at almost any franchise home improvement or hardware store as well as your local Walmart and Radio Shack. However, most don't offer DX-style antennas, pre-amplifiers or highest quality cable. The retailers listed below do and offer discounted prices as well as close-outs and "open box" products at even cheaper prices. Remember that prices vary from place to place and it's worth checking all sources for any particular item. Heavier products cost more to ship so consider splitting your order. For example, buy your DX antenna online and buy 100' of cable and rotator locally.
- Stark Electronic 444 Franklin Street Worcester, MA 01604 Phone: 508-756-7136 M-F 8:30 am - 5:00 pm ET. Carries Antennas Direct, Channel Master and Winegard antennas and pre-amplifiers, cable, connectors and tools. **www.starkelectronic.com/antinex.htm**
- Solid Signal 25225 Regency Drive Novi, MI 48375 877-312-4547 M-Thur. 7:00 am - 9:00 pm (ET), Fri 7:00 am - 7:00 pm, Sat. & Sun 10:00 am - 6:00 pm. Carries AntennaCraft, Antennas Direct, Channel Master, Terrestrial Digital, Winegard antennas, pre-amplifiers, cable, connectors, splitters, tools, etc. **www.solidsignal.com**
- Summit Source 4203 Merchant Road Fort Wayne, IN 46818 260-489-7525 M-F 8:00 am - 5:00 pm EST
- Carries AntennaCraft, Channel Master, Philips, and Winegard antennas and pre-amplifiers, cable, connectors, splitters, etc. **www.summitsource.com/antennas-accessories-c-47.html**

About the Author

Danny Oglethorpe has been an avid DXer since 1968. In addition to TV, he also monitors the shortwave, AM, and FM bands. He has been a member of the Worldwide TV/FM DX Association for sixteen years and has logged more than 1,000 TV stations.

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The handheld BCD396T scanner was designed for National Security/Emergency Preparedness (NS/EP) and homeland security use with new features such as **Fire Tone Out Decoder**. This feature lets you set the BCD396T to alert if your selected two-tone sequential paging tones are received. Ideal for on-call firefighters, emergency response staff and for activating individual scanners used for incident management and population attack warning. **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. Useful for intelligence agencies for use at events where you don't have advance notice or knowledge of the radio communications systems and assets you need to intercept. The BCD396T scanner is designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS, LTR and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. **Dynamically Allocated Channel Memory** - The BCD396T scanner's memory is organized so that it more closely matches how radio systems actually work. Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 3,000 channels are typical but **over 6,000 channels are possible** depending on the scanner features used. You can also easily determine how much memory you have used and how much memory you have left. **Preprogrammed Systems** - The BCD396T is preprogrammed with over 400 channels covering police, fire and ambulance operations in the 25 most populated counties in the United States, plus the most popular digital systems. **3 AA NiMH or Alkaline battery operation and Charger** – 3 AA battery operation - The BCD396T includes 3 premium 2,300 mAH Nickel Metal Hydride AA batteries to give you the most economical power option available. You may also operate the BCD396D using 3 AA alkaline batteries. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in the BCD396T scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - A blue LCD light remains on when the back light key is pressed. Autolight - Automatically turns the blue LCD backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BCD396T automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BCD396T also works as a conventional scanner to continuously monitor many radio conversations even though the message is switching frequencies. The BCD396T comes with AC adapter, 3 AA nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, SMA/BNC adapter, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO or ESAS systems. Order on-line at www.usascan.com or call 1-800-USA-SCAN.

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The handheld BC246T TrunkTracker scanner has so many features, we recommend you visit our web site at www.usascan.com and download the free owner's manual. Popular features include **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. **Dynamically Allocated Channel Memory** - Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 1,600 channels are typical but **over 2,500 channels are possible** depending on the scanner features used. You can also easily determine how much memory is used. **Preprogrammed Service Search (10)** - Makes it easy to find interesting frequencies used by public safety, news media TV broadcast audio, Amateur (ham) radio, CB radio, Family Radio Service, special low power, railroad, aircraft, marine, racing and weather frequencies. **Quick Keys** - allow you to select systems and groups by pressing a single key. **Text Tagging** - Name each system, group, channel, talk group ID, custom search range, and S.A.M.E. group using 16 characters per name. **Memory Backup** - When power is lost or disconnected, your BC246T retains the frequencies that were programmed in memory. **Unique Data Skip** - Allows the BC246T to skip over unwanted data transmissions and birdies. **Attenuator** - You can set the BC246T attenuator to reduce the input strength of strong signals by about 18 dB. **Duplicate Frequency Alert** - Alerts you if you try to enter a duplicate name or frequency already stored in the scanner. **22 Bands** - with aircraft and 800 MHz. The BC246T comes with AC adapter, 2 AA 1,800 mAH nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. For more fun, order our optional deluxe racing headset part **#HF24RS** for $29.95. Order now at www.usascan.com or call 1-800-USA-SCAN.

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The Evolution of a Revolution: A History of the Radio Club of America

By Carole Perry WB2MGP
(All graphics courtesy: Radio Club of America)

We've come a long way from the days of Marconi courting one of Britain's most revered men of science, Lord Kelvin, for his support on his work with wireless telegraphy. Kelvin had declared he was a skeptic on the practical future of wireless, stating famously, "Wireless is all very well, but I'd rather send a message by a boy on a pony."

The term "wireless," that was deemed old-fashioned and out of date many years ago, has re-surfaced as the most modern and up-to-date way to define the transfer of information via RF.

Any history of the Radio Club of America (RCA) will read like a who's who of the captains of industry and visionaries who have continued to advance wireless technologies including amateur radio, radio and television broadcasting, paging and data messaging.

One Hundred Years Old

The RCA present membership gathered at Georgetown University Conference Center in Washington, D.C., this past November to celebrate its 100th year anniversary and to pay tribute to its founders and pioneers in remembrance, and honoring them by having exciting plans for the future. The three day gala event enabled the newer members to be in the presence of many of our members who worked with and were a part of the accomplishments of many notables.

RCA Wireless, a long-standing industry publication, has ranked many past and current RCA members in its "Wireless Hall of Fame," including Major Edwin H. Armstrong, father of frequency modulation (FM) technology; Martin Cooper, father of the first portable cellular phone; Fred M. Link, founder of Link Radio Corp. and father of two-way radio; Mal Gurian, CEO of OKI Telecom, responsible for OKI receiving the first FCC type-certification for a cellular telephone; James Dwyer, founder of CTIA, the Wireless Association that challenged the FCC in the 1970s to allow competition; Robert Galvin, president of the family's business, Motorola, for 34 years; Jai Bhagat, who built a nationwide paging industry with John Palmer; Dale Hatfield, former chief of FCC's Office of Engineering and Technology; Jay Kitchen, who led industry trade PCIA-The Wireless Infrastructure Association, for ten years; Morgan O'Brien, who founded Nextel in 1987, and Arlene Harris, a 45 year wireless veteran, who founded Jitterbug; created the highly regarded SOS emergency phone, and who is also wife of Martin Cooper.

W.E.D. Stokes, Jr., in 1926 photo. In 1909, as a 14 year-old, Stokes founded the Radio Club of America, originally the Jr. Wireless Club and before that the Jr. Aero Club. By 1910 young Stokes was addressing the U.S. Senate as a self-proclaimed "trust buster" intent on stopping a potential ban on amateurs using the airwaves by commercial interests.

Edwin Armstrong, towering genius of radio, recognized by the Radio Club of America as the foremost figure in early radio history.

Origin of the Club

The story was told many times during the 100th Year Celebration about a group of young boys, back in the early 1900s, who were interested in flying, and formed the Junior Aero Club U.S. under the leadership of Miss Lillian E. Todd, recognized as the world's first female aircraft designer. The boys were: Frank King, W.E.D. Stokes, Jr., George Eltz, and Frederick Seymour. The young members of the club made model airplanes and attempted to fly them at the regular meetings which were held in a local armory.

The boys, still in their early teens, had also been interested in what was then known as "wireless." Mr. W.E.D. Stokes, Sr., called a special meeting of the Aero Club, for the purpose of forming a new club, with wireless telegraphy and telephony as its main interest. On January 2, 1909, the meeting was held at the Hotel Ansonia in New York City. In 1911 the name was changed to the Radio Club of America to include enthusiasts nationwide.

The early days of radio were real days of pioneering and darkness; days when traffic had to be handled with a coherer and a straight spark gap transmitter. The boys continued to meet and swap information with each other and gained the necessary knowledge to build their own receivers and transmitters. It was amazing that these boys could communicate at all, but almost any night one could hear messages being exchanged between stations in New York City, covering distances of at least a mile or two.

The adventurous people who founded the Radio Club of America were, in a way, pioneers in a new age, the Electronic Age. As David Sarnoff (Honorary Member 1926) said, "It all began with radio; with spark coils and slide wire tuners. Over the years the principles of radio were applied to an ever widening area until today, electronics permeates virtually every area of our daily lives."

Pioneers and Visionaries

Undoubtedly inspired by the giants who came before, the Radio Club of America, throughout its first 100 years has included or been associated with the following notables:

- **Dr. Allen B. DuMont**, who perfected the first commercially practical cathode ray tube and developed the modern oscilloscope.
- **William Lear**, known for his patents in electronics and the Lear Jet.
- **Dr. Louis Hazeltine**, inventor of the neutrodyne circuit.
- **John V.L. Hogan**, who held the 1912 patent of a single-dial tuning system for radio receivers

Lee de Forest and Allen B. DuMont in 1929. DuMont perfected the first commercially practical cathode ray tube and developed the modern oscilloscope.

and built the first high-fidelity radio station.

- **David Sarnoff**, who was responsible for bringing radio, and later television, into American households; became president of Radio Corporation of America, and later formed NBC. He was credited with transmitting news from the Carpathia regarding the sinking of the Titanic.
- **Frank Gunther**, the original developer of short wave radio equipment, who worked closely with military, police and fire departments.
- **Jack Poppele**, who built the original 250 watt transmitter for New York's WOR. In 1954 President Eisenhower appointed him director of the Voice of America.

In the Future

In its own subtle way, the history of an organization tells something about its future, too. History can be looked at and studied as a means of predicting and guiding goals and challenges in the future.

Here's what RCA Vice President Bruce McIntyre has to say:

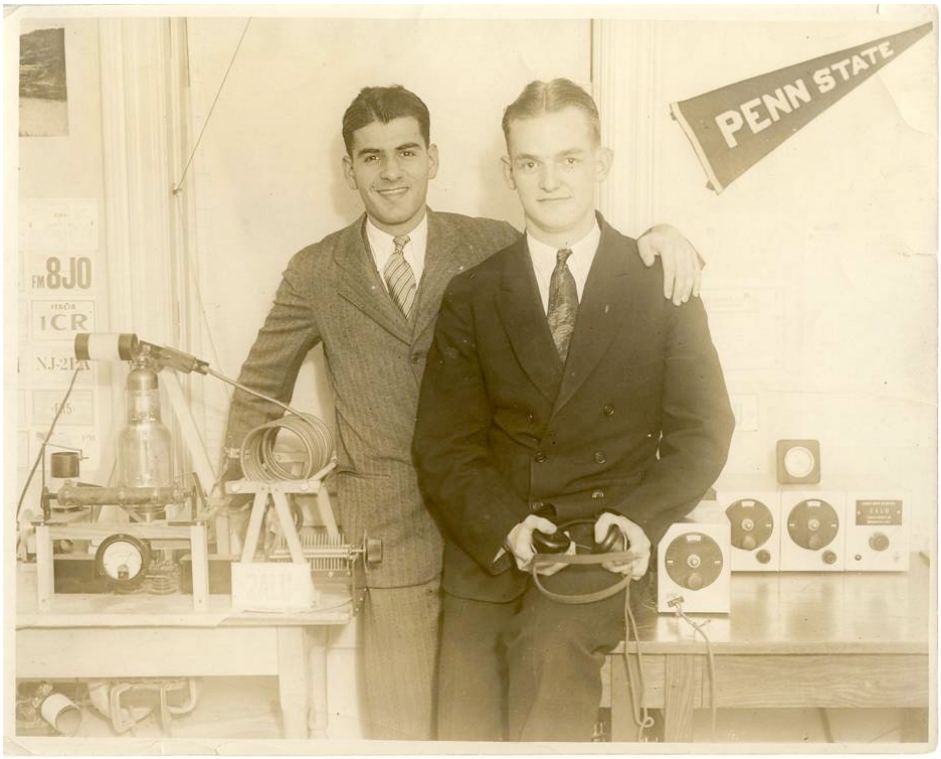
"It seems hard to believe the Radio Club is 100 years old. As we look at the history of the Club, we see many names of people who were innovators, inventors, and leaders of the wireless industry. Today we have members from all facets of the wireless industry; lawyers, educators, journalists, inventors, innovators and industry leaders.

What is the future of the Radio Club? The future is you. The future is with the professional or the student who is considering a career in the wireless industry. As we move further into the 21st century, the wireless industry will continue to be dynamic. Changes will bring new technology and the evolution of existing technologies. We want you to not only be a part of the proud history of the Radio Club of America, but we also want you to be a part of the future as we look forward to the next 100 years."

Dedication ceremonies of the 1BCG Monument, Greenwich, Connecticut, October 21, 1950. Left to right: Paul Godley, Edwin Armstrong, George Burghard, Wilbur Peck, Orestes Caldwell.

RCA President Stanley Reubenstein WA6RNU shares his thoughts about the future:

"The Radio Club of America has completed its first 100 years, and we are now beginning our second century. The Club has been called the first Amateur Radio Club in America, and also the first radio society. There are those who



Fred Link and John Knight in their Prospect Park YMCA room in Brooklyn about the time of the 1927 ARRL DX Contest. Knight 4DX, W2ALU, 6YY built the receiver for the initial W2ALU station; Link 3BVA, W2ALU, built the transmitter.

would dispute these 'firsts,' but what matters is that the Radio Club is over one hundred years old, and is still a viable entity in the world of RF communications.

"For our second century, the powers that be decided that we should not only continue our current philanthropic endeavors, but also be more proactive in our educational programs. With the assistance of seed money provided by Richard Somers W6NSV and management by Carole Perry WB2MGP the Youth Education Fund was created. Guided by the RCA Youth Education Committee, this program is designed to generate interest in communications technology in students in grades K-12. Using amateur radio as a mechanism to encourage interest, not primarily to recruit new amateurs (though this has been a great by-product), the program assists amateur radio clubs, teachers, and schools to create their own technology programs. This is done via training, financial assistance, and donations of equipment to use in the programs that are created. A wonderful network of the teachers and schools being helped has been established with lots of support and encouragement from RCA membership.

"Recognizing that the transition from basically RF communications to digital communications and control via Internet protocol had begun to bewilder technicians, the club came up with a solution. We now also provide an IP training course to communications professionals in conjunction with the Association of Public Safety Communications Officers (APCO).

"The times are changing and the Radio Club of America is doing likewise to remain a viable association."

Top row L to R, Robert Famiglio VP/Co-Counsel, Ron Jakubowski Director, Richard Biby Director, Tim Duffy Director, Robert Walsh Director,
Middle row L to R, John Belrose Director, Travis Marshall Director, Roger Madden Treasurer, Stan Reubenstein President, Bruce McIntyre Vice President, John Dettra Director, Robert Schwaninger VP/Counsel, Tom Tolman Director.
Bottom row L to R, Elaine Walsh Director, Debra Baker Director, Carole Perry Director, Sandra Black Director, Vivian Carr Executive VP, Margaret Lyons Secretary, Karen Clark Secretary
Photo taken at the November 2009 Centennial Board Meeting in Washington, DC.

What We Do

As mandated by the Constitution of the Radio Club of America, Inc., its purpose is, "…To operate exclusively for charitable, educational and scientific purposes…and more specifically to study and contribute to the development of radio communication programs and provide a scholarship fund for needy and worthy students for the study of radio communication."

Our fine scholarship program, which assists college students pursuing technical careers, and our Youth Activities Fund, which encourages creativity and technical expertise in wireless communications with students in grades 12 and below, are both clearly motivated by the spirit and intent set forth above.

RCA's specific outreach programs, in addition to the Scholarship programs include: Education, Historic preservation, and Networking opportunities. "It is a rare organization in any field that can claim active participation by the past, present, and future of an industry. The many activities sponsored by the RCA give its members a perspective on where we've come from and an insight into where we may be headed." – Elizabeth R. Sachs, Regulatory Counsel to the Enterprise Wireless Alliance (EWA).

Membership in the Radio Club is open to anyone who is actively involved in the wireless or broadcast industry, or the hobbyist and enthusiast who will commit to advancing the causes of RCA. We invite you to join us. For more information, call us at (303)948-4921 or visit us on the web at **www.radioclubofamerica.org**.

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The Radio Club of America, Inc. "Diamond Jubilee" Volume 54
The Radio Club of America, Inc. "Fall 2009 Proceedings"
The World of Ham Radio, 1901-1950, Richard A. Bartlett

The author wishes to thank Mercy Contreras, President Emeritus, Radio Club of America, who contributed the archival photos for this article and all those RCA members who generously gave of their time to offer suggestions and to share their own experiences. Carole Perry WB2MGP is a Radio Club of America Director, Fellow, and Co-Chair of the RCA Education Committee. She last appeared in the December, 2009 issue of MT as part of the First Person Radio series with the article "Reading, 'Riting and Radio."

All about Antennas Part 5: Accessories, Connectors and Adaptors

By Bob Grove W8JHD

In the four previous issues we've covered just about every aspect of antennas and their permutations. In this final chapter we'll discuss the best ways to connect them to radio equipment, and review the most important facts to remember.

At audio frequencies, any kind of connector will work as long as it can handle the voltage and current. But at radio frequencies, connector design is critical. Audio connectors, such as RCA phono connectors and earphone plugs, become increasingly deficient with frequency and have no specific impedance characteristics. They are usable up to about 30 MHz for receiving purposes.

Motorola connectors, developed for AM car radios, were grandfathered into VHF use when FM coverage was added to those radios. Early VHF converters needed Motorola connectors in order to interface with the car radios; then mobile scanners adopted them since the car antenna could be called into limited service for local scanner reception. Marginal in performance at VHF/UHF frequencies, Motorola plugs have been abandoned by scanner manufacturers in favor of infinitely superior BNC connectors.

The BNC was named for its configuration and inventors – it is a (B)ayonet design by (N)eill and (C)oncelman and is excellent for applications through at least 1,000 MHz (1 GHz). Neill also contributed his initial to the N connector, developed during World War II for military UHF communications. It is an excellent waterproof choice through at least 2 GHz, but harder to assemble since it is designed for large RG-8/U and R-213/U cables. Concelman's initial adorns the less popular C connector of World War II.

The PL-259 (the so-called "UHF" connector), developed during the 1930s, is still a favorite for HF ham and CB transceivers as well as shortwave receivers. It works well up to at least 50-100 MHz.

Low-cost, TV-type F connectors work extremely well through at least 1 GHz, but they require solid-center-wire cable, and adaptors are always needed to interconnect communications equipment and accessories.

Some imported nickel-plated connectors are poorly made; their loose fittings and out-of-tolerance thread pitches can add noise, intermittent performance, signal loss, and electrolytic corrosion to the system. On the other hand, a lab test at Grove Enterprises showed only a fraction of a dB loss at 1 GHz from five different, imported, nickel-plated adaptors cascaded in series.

But, to be safe, it's always better to choose a branded, silver (or gold) plated connector or adaptor if available. Better yet, use a cable with the correct connectors instead of adaptors.

Preamplifiers

A preamplifier ("pre-amp" or "signal booster") is simply a small-signal amplifier placed between the antenna and receiver. When integrated with a small receiving antenna, the combination is called an active antenna (previously discussed).

A preamplifier connected to a poorly-located antenna will not perform as well as a well-placed, larger "passive" (unamplified) antenna, but it may be the only alternative when the better antenna is not practical. If a shortwave receiving antenna is at least 20 feet long and in the clear, a preamplifier is probably unnecessary.

A preamplifier should only be used in exceptionally weak signal areas.

A preamp must have a lower noise figure (self-generated "hiss") than the receiver, or the only thing it accomplishes is increasing both signal and noise, just as if you had merely turned up the receiver's volume control.

It must have wide dynamic range – the ability to amplify weak and strong signals equally without becoming overloaded and thus generating spurious signal products, known as intermodulation (intermod), which interfere with normal reception.

At VHF and especially UHF frequencies and above, where transmission line losses may become significant, a preamplifier mounted at the antenna will boost signals above the loss characteristic of the line. Still, the preamp is vulnerable to all the problems described above.

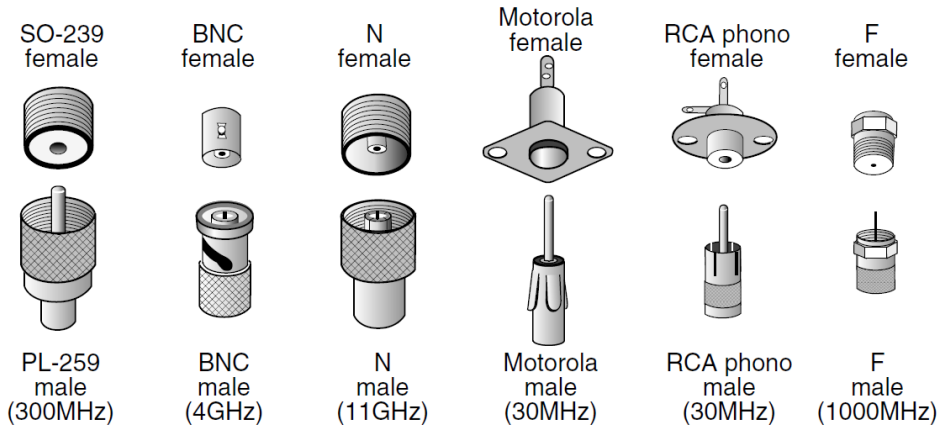
Even when working perfectly, a preamp can cause the receiver to overload and generate intermod of its own, desensitizing it to weak signals, aggravating images, or even damaging its delicate RF amplifier circuitry. Use it as a last resort.

Splitters and combiners

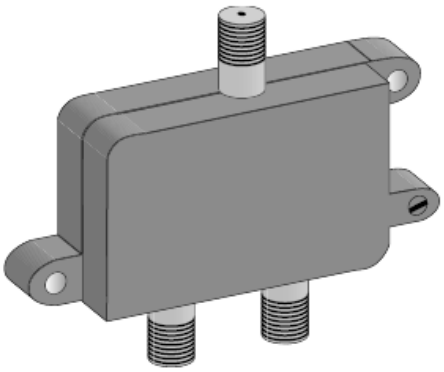
A splitter is essentially a broadband RF transformer which allows one signal source to be equally divided into two or more paths; this allows, for example, several receivers to operate from one antenna.

Since a typical two-way splitter is an RF voltage divider, each output will be reduced by 3 dB, half the original power level.

Connected in reverse, a splitter becomes



The most common antenna connectors and their maximum recommended frequencies.



Splitters are used to feed one antenna to two (or more) receivers; they can also be used in reverse to combine two (or more) antennas to operate one receiver.

a combiner, allowing two signal sources to add commonly. This allows, for example, two separate-frequency antennas to be used simultaneously with one receiver.

But, if the two antennas have a similar frequency response, they can produce destructive interference (signal canceling) from certain directions, while providing 3 dB overall gain in other directions. Basically, they comprise a directional array – a "beam" antenna.

TV splitters marked "V/U" or "VHF/UHF" or "54-890 MHz" actually work reasonably well from the low HF range (typically 3 MHz) up through 1 GHz.

While there are transmitter splitters and combiners, those made for receivers are far more common and less expensive. They will also allow low power – a few watts – to pass without much problem, but higher power levels will heat the fine winding and saturate the small ferrite core, wasting power and even destroying the device.

TV Splitters

Splitters used to couple two or more TV sets to a common antenna system are quite suitable for general-purpose receiving installations. Most are marked with their recommended frequency application.

Those intended for powering satellite-dish low-noise block down-converters (LNBs), marked 950-1450 MHz, should be avoided for shortwave and scanning, but those marked 5-900 MHz work well from shortwave right up through VHF/UHF scanning.

Such splitters are usually DC passive; that is, their windings are electrically interconnected so that voltage may transferred through the splitter to activate an antenna-mounted preamplifier or down-converter.

However, if you have voltage on the line but don't want it to get through your DC-passive splitter, and don't have a DC-blocked splitter available, there are accessory F-to-F fittings that contain a DC-blocking capacitor that may be attached to the splitter. Some splitters offer a combination of passive and blocked ports on the same device.

Conventional installations which have no DC power requirements on the transmission line work just fine with either DC passive or DC blocked splitters.

Balun transformers

The term "balun" (a contraction for "balanced to unbalanced") is a wideband RF transformer that allows an unbalanced transmission line (coax) to be used with a balanced antenna (dipole or beam). Many transmatches include balun circuitry.

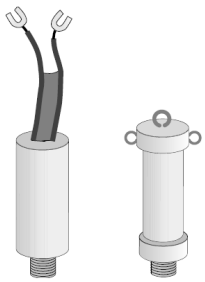
Balun transformers may incorporate a step-up ratio (typically 4:1) to allow low-impedance coax to correctly match high-impedance antenna feed points, or a simple 1:1 ratio to connect coax (unbalanced) to a balanced feed point.

Instead of a 1:1 balun transformer, a ferrite bead RF choke at the antenna-coax feed point will reduce RF on the feed line by absorbing unbalanced power.

Like splitters, VHF/UHF TV balun transformers can be used with VHF/UHF scanners, shortwave receivers down to about 3 MHz, and even for low-power (a few watts) transmitters.

If a balun transformer is connected between the feed line and antenna, a transmatch will still resonate the entire system – balun, antenna, feed line, tuner, and interactive environment (tower, nearby wires, trees, rain gutters, etc.).

But the tuner does not change the antenna's natural feed point impedance; if there was a mismatch between it and the balun or feed line before the tune-up, it will remain even after the tuner is adjusted to resonance and shows a 1:1 match.



Balun transformers are used for matching coax to antennas.

A balun works properly only with resistive (non-reactive) loads; system reactances can cause impedance transformation ratios different from what was intended. Therefore, it is not a good idea to use a balun over a wide frequency range on a narrowband antenna. Baluns also add losses, due to wire resistance and possible core saturation during transmit.

Attenuators

It may seem self-defeating to make received signals weaker, but under some conditions it is advisable. For example, if you live near several broadcast transmitters, or a high-powered paging transmitter, or if most signals in your area are quite strong, they may be too hot for your receiver or scanner to handle.

Receivers may "come apart" under these conditions, generating spurious signals (intermod) or even desensitizing, making weak-signal reception virtually impossible.

If your outdoor antenna causes either of these symptoms, an attenuator may be the prescription; some receivers and scanners have them built in. But if an attenuator is likely to make desirable weak signals unreadable, try a filter.

Filters

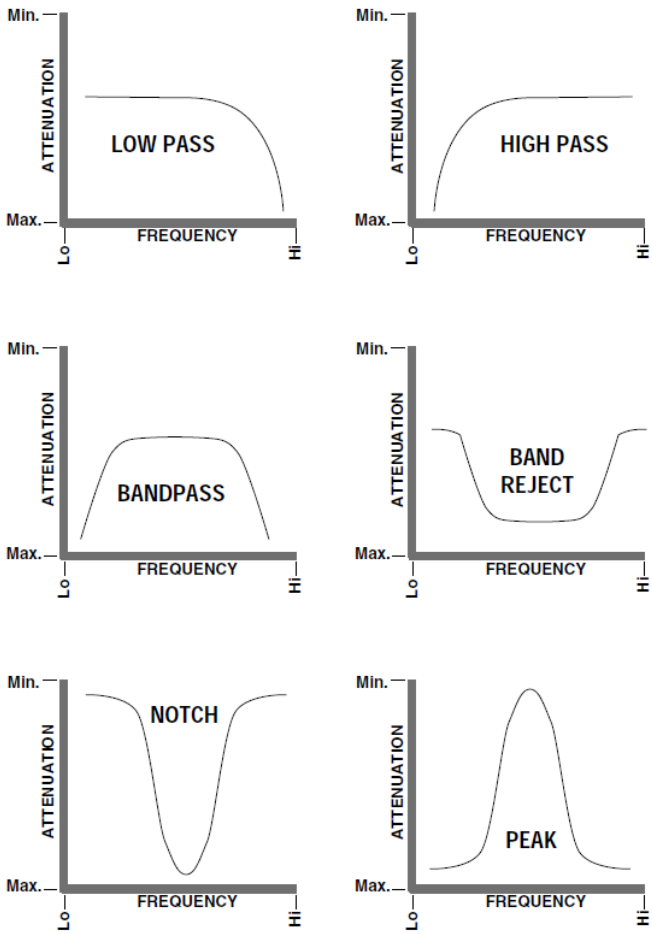
A filter is a tuned circuit which allows only certain frequencies to pass; their generic names imply what they do.

A low-pass filter passes low frequencies and attenuates higher frequencies, while a high-pass filter passes high frequencies and attenuates lower frequencies.

A band-pass filter passes a specific range of frequencies, while a band-reject ("suck-out") filter attenuates a swath of spectrum.

A trap, or notch filter, attenuates a very narrow range of frequencies, while a peaking filter passes a very narrow range of frequencies.

Filters can be used with transmitters to reduce harmonic and other spurious signal radiation, or with receivers and scanners to selectively reduce strong, interfering signal



Types of filters.

Filters are used to remove unwanted signal interferences.

frequencies.

No filter is perfect in its characteristics; desired signals near the edges of the design range (cutoff frequencies) will also be attenuated somewhat. Even at the center of its attenuation range, some strong signals may still get through. A credible manufacturer will publish the response curves of his filters to reveal their limitations.

Antenna switches

It is often desirable to select among two or more antennas for optimum reception or transmission. For receiving purposes, or even for low power (a few watts) transmitting, TV coax antenna switches work admirably from DC through 1000 MHz. CB-type antenna switches work fine up to about 30MHz, for both receiving and transmitting.

For higher power, especially at higher frequencies, select a commercial coax switch rated for the frequency range and power required.

Antenna switches should be chosen carefully, both to handle high power when used for transmitting, and for low loss when used at VHF/UHF.

Biohazards

It has long been known that electromagnetic radiation can produce effects in biological organisms; of particular concern to radio hobbyists is the influence of radio waves on the human body.

If we consider the adult as an antenna, it has a natural resonance between 35 MHz (standing, grounded) and 70 MHz (insulated from ground).

Body parts, too, are resonant – the head at around 400 MHz (700 MHz for infants). Since the body is a lossy conductor, it dissipates much of the induced energy as heat. But in most cases it is not thermal affects that are of the greatest concern.

On-going controversy revolves around whether cancers may be induced by low-level AC fields from power lines and associated equipment and appliances, as well as transmitted radio fields.

Virtually all studies suggest that power levels under 100 watts or so into an elevated outdoor antenna are safe. Concern mounts with indoor, attic, mobile, and low-elevation, directional, transmitting antennas.

Until all the facts are known, it is best to follow these guidelines:

(1) Keep away from antennas and open-wire feed lines that are transmitting.
(2) Elevate well overhead any transmitting antennas, especially directional beams which concentrate their energy.
(3) Operate nearby transmitting antennas (mobile, attic, in-room) at low power (nominally no more than 25 watts).
(4) Operate RF power amplifiers with their covers in place.
(5) Hold hand-held transceivers away from your head by using extension mikes.
(6) Stay at least two feet away from power transformers.

Take-Home Points – Facts, Not Fiction

As we close this five-part series on antenna systems, here are some of the most important parts to remember:

1. Except for very thin wires, most antennas are efficient radiators. Virtually all losses in an antenna system occur in the feed line.
2. A high standing wave ratio (SWR of 3:1, 6:1, etc.) merely indicates the presence of power reflections on the feed line due to impedance mismatch. If there are no losses in the feed line, all reflected transmitter power will be returned to and radiated by the antenna.

   For receiving systems, all captured signal power will be returned to the receiver. If there is an impedance mismatch between the receiver and transmission line; however, reflected signal power will return to the antenna where it will be re-radiated back into space
3. Reflected power does not flow back into the transmitter and cause damage or overheating. If damage occurs, it is due to mistuning the amplifier.
4. A low SWR reading only means that the transmitter, feed line and antenna system are impedance-matched; it does not necessarily mean that everything is working properly.

   Corroded or intermittent connectors, ineffective grounds, lossy cable and other resistive agents can all give a deceptively low SWR. Unless an antenna is broadband by design, a low impedance maintained over a wide frequency range without retuning is particularly suspect.
5. Neither an antenna nor the feed line needs to be self-resonant (no inductive or capacitive reactances) to perform properly. Virtually any antenna and its feed line, no matter how reactive, can be brought to resonance by a properly designed transmatch.
6. Using low-loss transmission line, and at frequencies below 30 MHz or so, signals experiencing an SWR of at least 3:1 and perhaps as high as 5:1 will be indistinguishable from signals produced by a perfect 1:1 impedance match.
7. Adjusting a transmatch at the radio position does not alter the reactance or impedance of either the antenna or the feed line; it brings the entire mismatched and reactive system into resonance by "conjugate matching," introducing reactance-canceling capacitances and inductances of its own, so that the attached receiver or transmitter senses only a resistive load.
8. A large antenna does not radiate more power than a small antenna, nor is more power radiated from a particular configuration (dipole, vertical, beam, quad, cage, bowtie, rhombic, loop, etc.). But a large antenna does radiate a more concentrated, directional field than a small antenna, and it captures more signal energy during reception.
9. No transmission line needs to be a specific length if a transmatch is available. Adjusting the length of a feed line does not alter the SWR, just the impedance measured at the tuner/feed line connection.
10. High SWR in a coax feed line does not cause RF currents to flow on the outside of the line, nor will the coax radiate. High SWR on an open wire feed line will not cause the feed line to radiate as long as the currents are balanced, wire spacing is small compared to wavelength, and there are no sharp bends.
11. Assuming low-loss feed line, an SWR meter will read the same at the antenna feed point, anywhere on the feed line, and at the transmitter.
12. Raising or lowering an antenna to adjust its feed point impedance has no significant effect on power radiated, only the shape of its elevation pattern. However, raising the pattern between 3 and 20 degrees from the horizon can improve DX communications.
13. A frequency meter or dip oscillator connected at the bottom of a feed line cannot measure the resonant frequency of the antenna; it measures only the combined resonance of the antenna plus the feed line.
14. A balun transformer on a transmitting antenna will match impedances correctly only if it is used within its power limitations; excessive current may saturate its core, wastefully heating the balun while giving a deceptive SWR reading.
15. A loading coil on a short antenna doesn't add missing length, it adds inductive reactance to cancel the capacitive reactance of the short antenna.
16. A transmatch doesn't "fool" the transmitter or receiver into "thinking" it is connected to the correct impedance any more than an AC wall adaptor "fools" a radio into "thinking" it is getting 12 volts DC when it is plugged into 120 volts AC. In both cases power and impedance transformations really occur.

RECOMMENDED READING

The ARRL Antenna Book, published by the American Radio Relay League, 225 Main St., Newington, CT 06111.

Antennas J.D. Krauss, second edition, 1988; McGraw-Hill Book Co.

MT

Radio Dreams of a Lifetime

By Jack K. Neal W8AQ
(All photos courtesy the author)

As I write this I've just completed a cross-country move from Texas to Illinois. That trek was to take the general manager position at WEIU-TV-FM. I left behind the heat and hurricanes of Houston for the corn and Midwestern values of Charleston, Illinois.

Before Texas, I'd run the public television station in Roanoke, Virginia; served as station manager in Syracuse; New York, spent years in Cleveland, Ohio and worked at a host of commercial radio stations in Indiana, Iowa, Minnesota and Ohio in the early 1970s, and I've traveled to Europe and Asia in the production of PBS documentaries. But how did I get here? What took this kid, who grew up in rural Ohio, along the path that would find him traveling through every state in the continental U.S., across Asia and Europe and finally back to the Midwest?

The SWL, CB and Ham Days

Well, as Ted Baxter often opined in the fictitious WJM-TV newsroom, "It all began in a small 250 watt AM day-timer in Wabash, Indiana." OK, some literary license there. But, the professional part of my life really did start at a station so small we barely reached the county line. My time at the old WAYT was, in many ways, the inevitable next step from those days as a kid sitting in my bedroom listening to the static and fading that accompanied the likes of Radio Moscow, HCJB, the BBC, Radio Peking (as China Radio International was known then) and the many feeds of the Voice of America, heard through the old carcass of what, at one time, had been an early 20th century Zenith floor model radio. The case for that old radio was long gone and the huge speaker had several rips in the paper. But to a kid out in the middle of nowhere it brought in the excitement of the world every evening.

Each night was a new adventure. I had strung a simple long wire out the window and attached it to one of many pine trees down the quarter-mile long driveway. As simple as my "contraption" (as Dad used to call it) was, it opened up a universe to me. I'd spend endless hours tuning, listening, retuning and logging what I'd heard. Then each Saturday, it was a trip with Mom or Dad to the post office in town. There I'd send out my reception reports to exotic places around the world and await the return of a colorful and amazing QSL card.

In the case of Radio Peking, Radio Havana and Radio Moscow, a continuous supply of propaganda would follow to carefully show this pre-teen American boy the perceived advantages

The picture on the front of this QSL card, for my earlier call KI4DZS, is from a documentary I did on Vietnam.

1960s Knight C-100 walkie-talkie kits that first got me "on the air."

of their political system. Heck, I figure I must have single-handedly been responsible for ending the Cold War just with the expense that went into printing out and mailing all the propaganda that we SWLers received!

The other activity that often coincided with tuning the bands, trying to pull weak signals out of the air, was thumbing through the magical dream books of our day. Yes, I speak of the Heathkit and Allied Radio catalogs! I memorized within weeks of its arrival every word ever written about the Knight Kit Star Roamer, the Span Master and dare I dream even bigger and consider the R-55 general coverage *and* ham band receiver? These were far beyond the financial limitations of a young kid living in a world that meant a twenty-five cent a week allowance *if* it was a good week! But it didn't stop me from dreaming. So I'd wear those catalogs out page by page while tuning that old Zenith.

Then there came a day when, for whatever reason, I acquired enough money to order a kit on my own! Well, it wasn't enough money for a receiver. It *was* enough to not just let me listen to the world, but to GET ON THE AIR! For in this burgeoning world of personal communications, these were the days of the emergence of the change of eleven meters from a ham radio band to the beginning of the citizens band.

Yes, early CB. But this was not the "Smokey and the Bandit," "Catch you on the flip-flop," "I got your back door" days that would follow in the next decade. This was a time when many early CBers would learn the value of RF communications and would eventually move on to ham radio or, in my case, professional broadcasting. But I'm getting ahead of myself. Back to that Knight Kit!

First Magic

My kit of choice, costing under $6, was a Knight Kit C-100 walkie-talkie. Yes, one hundred booming milliwatts of power able to light up the ether to a distance of nearly a quarter of a mile! Never mind the fact that would barely make it to the street from our house in the woods, it was new, electronic and it was a radio. That made it perfect!

I still remember ordering from the well-worn Allied radio catalog and awaiting the mailman's delivery. When that day finally arrived I couldn't wait to tear into it. The bright blue plastic case and a couple of plastic bags filled with electronic components seemed like they were a Collins receiver to me at that time.

Carefully checking the color code on the resistors; good solder joints; not too much heat to the transistor leads, I kept it all in mind as I very carefully, but diligently, assembled my kit. And then that moment when I plugged in the nine volt battery, screwed in the telescoping whip antenna and pushed the slide switch on, magic happened!

OK – but that's how it all started. Not unlike many of us of that era who had very similar stories to tell. But how did this end up getting me to managing radio and TV stations? Yes, I loved my shortwave hobby and transitioned briefly into early CB (Dad was KHJ-7152 and Mom was KLM-4429). But for a kid too young to own and drive a car and without the resources for the Browning and Tram transceivers of the day, ham radio seemed the best next step. I could do it on the cheap!

There followed lots of time on a simple buzzer and basic straight key. Even more time spent with the ARRL *License Guide* and I emerged as WN8ZNO. I was so proud of that license. Yet I became even prouder of the Heathkit DX-35 transmitter I bought very used for $10 and of my next kit endeavor, a Knight Kit R-55A, a bigger project and much more work with a dial system that I'm not sure I understand to this day! But it got me started.

As I spent time in ham radio and upgraded

W8AQ's grandfather, R.W. Neal W8CEI, in his radio shack in Columbus, Ohio, circa late 1930s, with his homebrew kilowatt transmitter and Hammarlund receiver.

to my general class ticket and WA8ZNO, I became more and more interested in the possibility of radio as a career. Initially, I leaned toward engineering but eventually saw that my real interests included much more. I perused radio and TV program schedules, studied the radio formats of the day: Middle-of-the-Road, Top 40, and Easy Listening. I followed most kinds of music and became a devoted student of news. All of that, after sending out many dozens of resumes and tapes, eventually got me to WAYT and Wabash, Indiana…yes that little 250 watt day-timer, remember?

On the air at first broadcast station WAYT, a 250 watt day-timer out of Wabash, Indiana.

Air Checks and Paychecks

Though I arrived in town a day too late to report on the little town's only murder case of the year, (a domestic on the town's main street as I remember), I did get there in time to report on the jail break a month later where the fugitive ran by a fledgling radio reporter on his way out of the jail building.

Yeah, it took awhile to look the sheriff in the eye again after that!

From there I traveled up and down the dial (blatantly stealing a line from the theme song to "WKRP in Cincinnati"). Radio in the early and mid-70s was an interesting time; the emergence of FM and the beginning of the end of the wild days of the 60s rock jock. While there was lots of fun to be had, and I enjoyed much of it, times were changing quickly. There was a shrinking supply of money for deejay's, announcers and news people.

One station comes to mind where I had the distinct advantage, being the all-night jock, because when paychecks came out I could get to the bank and hopefully be one whose check didn't bounce. Well, that was when we were still getting paychecks! Those ended at one point, too.

As I spent time traveling through commercial radio stations in Ohio, Indiana, Iowa and Minnesota, I became more aware that, while I loved the industry, I needed to get beyond commercial radio if I were to make it a career. That transition was to happen in Cleveland, Ohio when I took a job as an announcer and field producer for WVIZ-TV.

Those days were transitional in television, as well. Control rooms were filled with huge quad tape machines with ten pound reels of two-inch wide tape for every program and spot we aired. The master control and tape operators were true professionals who worked hard to follow a log and keep viewers seeing what was scheduled to be seen. No computer. No software. Just experience. My job, as one of the last *live* break announcers in the industry, was to not only voice-tag the spots, but to make whatever changes needed to be made on the fly. It's a job that doesn't exist now and hasn't for decades, but I found it rather exciting given my background as a radio hobbyist. It got me hooked.

During the nearly ten years I spent at WVIZ, I had the chance to learn essentially everything that happens in a TV station, thanks to our general manager, Betty Cope. Betty had been one of the first women in television production in the country as well as one of the first women general managers. She was experienced, opinionated and tough. She made me think out my decisions and often to explain them. Years later I found her to be my model when I was to sit in the GM's chair.

From Cleveland, I moved to Syracuse, New York, where I spent nearly fourteen of the most productive, and coldest, years of my career. It was there at WCNY that I was allowed to move through the ranks from promotion to production and programming and eventually to managing when I took over the role as TV station manager in the mid 1990s.

The many experiences in Syracuse piqued my interest in managing a station and in late 2000; I was hired as the president and general manager of the three stations that made up Blue Ridge Public Television, headquartered in Roanoke, Virginia. To this day I love that station, that market and the people of southwestern Virginia. They took a Yankee from upstate New York and made him comfortable in the heart of Dixie. It was during this time that we accomplished our digital rebuild and put three new digital transmitters on the air. It was also here that I was presented the opportunity to head to Vietnam to

W8AQ QSL from 2002

produce the documentary commemorating three decades since the end of the war.

My times in Virginia were very special, living along the Blue Ridge Parkway and getting back into ham radio, first as KI4DZS and later as W8AQ, when I passed my Extra Class exam. Through the station and the radio clubs, I met hundreds of amazing electronic hobbyists and professionals. Six years later, the attraction of being near my mom and dad in their later years made me jump significantly in market size and head to the Texas Gulf and the first public broadcasting station in the nation, KUHT, Houston PBS.

As the station manager of this major market facility, I was able to get involved in one of the most significant projects of my career, and one that just recently aired on most PBS stations, "The Wall: A World Divided." As the Executive in Charge of Production, I was given a chance to get involved in the telling of the story of the fall of the Berlin Wall. We told the stories through the eyes and words of President George H. W. Bush, former Soviet President Mikhail Gorbachev and West German Chancellor Helmut Kohl. Most importantly, we told the story of the German people who made it happen. I was fortunate to be involved with an amazing team of people who brought it all together.

With Pres. George H.W. Bush during production of PBS documentary "The Wall: A World Divided."

That brings me to today. Fresh from a move to east-central Illinois and the excitement of the GM's chair at WEIU. It has been an amazing journey from sitting on my bed as a kid tuning the dial of the old Zenith and basking in the warm glow of those tubes, around the country, around the world and now running the radio and TV Center for Eastern Illinois University. Yeah, dreams really *do* come true!

SCANNING REPORT

THE WORLD ABOVE 30MHZ

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Keeping an Ear on the Weather

Heat, humidity and upper air disturbances in late summer often bring afternoon and evening thunderstorms, and occasionally tornadoes, hail, heavy rain and other severe and potentially damaging weather. Listening to weather broadcasts and keeping a weather alerting radio nearby can help keep you safe, dry, and out of harm's way.

❖ Scanning Weather

The National Oceanic and Atmospheric Administration (NOAA) operates about a thousand National Weather Radio (NWR) broadcast stations across the United States and her territories, transmitting on one of seven frequencies in the VHF Public Service band:

162.400, 162.425, 162.450, 162.475,
162.500,162.525, 162.500

The NWR network has grown over the years, from just two aviation weather stations in the 1950s to 400 stations in 1990, 600 in 2000 and 960 in 2006. As of this year there are now 1,000 NWR transmitters covering 97 percent of the population, serving all 50 States and adjoining coastal waters, Puerto Rico and the U.S. Virgin Islands, and the U.S. territories in the Pacific Ocean.

Each station covers a circular area out to roughly 40 miles from the transmitter, assuming relatively flat terrain. Some sparsely populated areas and mountainous locations may have spotty reception or lack coverage altogether.

NWR broadcasts are sent 24 hours a day, seven days a week, and include current weather conditions, forecasts, alerts and warnings. NWR stations also broadcast emergency information from the Federal Communications Commission's Emergency Alert System (EAS), providing the public with government announcements related to natural hazards such as earthquakes and mud slides, man-made problems like oil spills or poisonous chemical releases, and general public safety notices.

Nearly every scanner built in the past 30 years covers these seven NWR frequencies. Knowing them, or at least the one serving your local area, is a great way to test a scanner you just found or are considering purchasing. Plugging in that NWR frequency should get you an immediate audio signal that you can use to gauge the operation and clarity of the scanner.

You can find a listing of stations on the National Weather Service web site at **www.nws.noaa.gov/nwr/nwrbro.htm**

❖ Specific Area Message Encoding

The NWR broadcasts carry more than voice announcements. Information related to the type and location of hazards is also transmitted in short digital bursts, intended for weather receivers with a digital decoding capability. These messages are referred to as Specific Area Message Encoding (SAME) and can automatically trigger modern weather radios with the "Public Alert" feature to beep, flash, display a text warning, or turn on the audio speaker to announce the alert. These actions are called "cues" and are intended to improve the safety of the public at large by grabbing their attention when something is happening.

While commercial radio and television stations are required to transmit national security warnings, alerting the public to more localized events and hazards is left to the discretion of the broadcaster, leaving many citizens uninformed about nearby hazards.

The Consumer Electronics Association (CEA) defines the standard that a receiver must meet in order to display the Public Alert logo. These weather radios have been available since 2004 and are compatible with both the NWR and the Environment Canada's Meteorological Service of Canada Weatheradio network.

Because the signal from a NWR station may cover 250 square miles or more, emergency alerts do not always apply equally to everyone within the listening area. The digital messages contain a six-digit identification number that specifies the geographic area affected by the hazard. This allows properly equipped receivers to respond only to those alerts directly affecting the listener and reduces the number of "false alarms" heard.

You can find a list of SAME codes, organized by state and county, on the National Weather Service web site at **www.weather.gov/nwr/indexnw.htm#sametable**

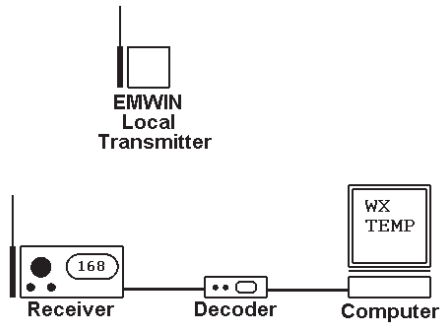
For example, the SAME code for the District of Columbia is 011001, as shown in the listing below:

County/City/Area	SAME #	NWR Transmitter	Frequency
District of Columbia	011001	Baltimore, MD	162.400
District of Columbia	011001	Manassas, VA	162.550
District of Columbia	011001	Washington, DC	162.450

❖ Emergency Managers Weather Information Network

The National Weather Radio transmissions are audio broadcasts intended for the general public. The National Weather Service also disseminates much more detailed and comprehensive weather data to emergency management agencies and other public safety organizations. Fortunately, the NWS makes the same data available to anyone with the interest and capability to monitor it.

The data feed is called EMWIN, short for Emergency Managers Weather Information Network, and it is available in several ways.



NWS broadcasts EMWIN over two satellites, called GOES East and GOES West. GOES East can be found in the Clarke Belt at 75 degrees West and GOES West at 135 degrees West. Together they provide coverage for the North American continent. EMWIN data are transmitted up to both of these Geostationary Operational Environmental Satellites from a NOAA facility on Wallops Island in Virginia. The 9600-baud data stream comes down from both satellites at 1690.725 MHz.

A number of commercial vendors sell hardware and software to receive these satellite broadcasts. NWS maintains a web page listing of vendors at **www.nws.noaa.gov/emwin/winven.htm**

❖ Local EMWIN Broadcasts

If you're not interested in setting up and maintaining a satellite dish, there are a couple of alternatives. Some emergency management agencies as well as other organizations have volunteered to receive the EMWIN data stream via

satellite and rebroadcast it locally on dedicated VHF and UHF frequencies.

In order to monitor successfully, you will need to be in one of these rebroadcast areas and have the necessary hardware and software. A decent antenna and a receiver capable of tuning one of these frequencies are the prerequisite to collect the signal; a demodulator converts the radio signal into a digital data stream, and a personal computer running EMWIN software allows you to see the final product.

The NWS has five VHF frequencies for rebroadcasters to use: 163.300, 163.325, 163.350, 168.8125 and 168.7125 MHz.

For instance, in the north Texas area there are at least four EMWIN radio stations:

Location	Frequency	Data Rate
Denton	168.7125	1200
Fort Worth	163.3250	1200
Mesquite	168.8125	1200
Paris	168.7125	1200

Depending on the rebroadcaster, the EMWIN stream may be complete or it may be filtered to carry only a subset of the total weather data. They may also add relevant local information, such as road conditions and rush hour traffic delays.

❖ EMWIN via the Internet

Like most things these days, the data products in the EMWIN data feed are also available via the Internet. If you browse to **www.weather.gov/view/national.php** you will see a list of reports, summaries and forecasts available for the nation and for individual states. If you'd rather not sit in front of a computer screen all day, you can find a service that will do the equivalent for you.

The Emergency Email & Wireless Network (**www.emergencyemail.org**), for example, offers to send emergency notifications of severe weather, national security and health warnings directly to an email address, or your cell phone or pager. Alerts are organized by state and then by county, and you can apparently sign up for as many geographic areas as you'd like.

❖ SKYWARN

If you'd like to get more involved in watching and identifying severe weather in your area, the SKYWARN program might be a good place to start. The program, overseen by the National Weather Service, trains and organizes volunteers to spot severe weather. There are nearly 300,000 trained spotters across the country, observing and reporting tornadoes, thunderstorms, floods and other potentially dangerous weather conditions.

Although more than half of all trained spotters are not Amateur Radio operators, much of your local SKYWARN traffic can probably heard through a club or repeater on Amateur Radio frequencies between 145 and 148 MHz. Specific frequencies vary by geographic region, but if your scanner can tune within that range, you may be able to hear severe weather observations from spotters in your area. Each of the 122 National Weather Service offices has a Warning Coordination Meteorologist that administers SKYWARN for their region.

You can get more information about the program, spotters and some of the frequencies they use from the NWS web page at **www.nws.noaa.gov/skywarn**.

❖ Cary, Illinois

Dan,

I am not able to hear police dispatches from the Cary Police Department in northern Illinois any more. They used to have a dedicated frequency but I haven't heard them in quite a while. Do you have any idea where they might have moved?

David in Illinois

Cary is a town of about 18,000 located in McHenry County, Illinois, located about 40 miles northwest of Chicago. It's grown rapidly in the past 30 years, having had a population of around 5,000 in 1980.

The Cary Police Department used to handle their own public safety answering point (PSAP) 9-1-1 telephone answering and public safety dispatch operations, as did many small towns in the Chicago suburbs. However, in recent years there has been a movement to consolidate the dispatch operations of several towns into a single shared facility. Rather than each jurisdiction spending taxpayer money to build and maintain individual dispatch offices and trained personnel, these combined centers share those costs, reducing the public safety expenditures for each member.

Based in Crystal Lake, a city a few miles northwest of Cary, the Southeast Emergency Communications Center (SEECOM) provides dispatch services for a number of communities in the southeastern corner of McHenry County. This area is largely a suburban bedroom community for nearby Chicago, with more than 200,000 residents living in numerous small towns and villages.

SEECOM was founded as the Southeast McHenry Communications Centralized Dispatch System, a partnership between Algonquin, Cary and Crystal Lake. Cary's Police Department was the first organization to sign up for service, agreeing to join the system in November 2001. Other public safety agencies soon followed and the new dispatch center located in the basement of Crystal Lake City Hall opened in October 2005. Villages and towns currently served by SEECOM include Algonquin, Cary, Crystal Lake, Fox River Grove, Huntley, Lake in the Hills, Lakewood, Nunda and Oakwood Hills.

SEECOM uses the following frequencies for dispatch operations:

Frequency	Description
154.250	Fire Dispatch (Cary, Fox River Grove, Nunda)
154.355	Fire Dispatch (Algonquin and Lake in the Hills)
155.430	Cary Police (Alternate)
155.4975	Fire Dispatch (Huntley)

155.700	Crystal Lake and Lakewood Police (Dispatch)
155.740	Algonquin Police
155.9625	Fireground
156.165	Fire Dispatch (Crystal Lake)
857.2375	Cary and Oakwood Hills Police (Dispatch)

A number of additional VHF frequencies are also licensed by or through SEECOM for statewide and local public safety:

Frequency	Description
155.475	Illinois State Police Emergency Radio Network (ISPERN, statewide)
155.4825	ISPERN 2
155.055	Illinois Radio Emergency Assistance Channel (IREACH, statewide)
155.370	Illinois State Police (point-to-point, statewide)

The Village of Cary and the local school systems also use the following frequencies:

Frequency	Description
155.265	Districts 47 and 155 School Buses
155.295	Cary Elementary School District 26 Operations
155.880	Cary Public Works
453.1875	Cary Public Works (Water Data Telemetry)

County law enforcement operations have moved to the statewide STARCOM21 digital system, so you probably will not be able to hear Sheriff operations on these long-time traditional frequencies:

Frequency	Description
155.070	[old] Sheriff (Task Force)
155.520	[old] County Jail
155.790	[old] Sheriff (Main and Car-to-Car)
159.210	[old] Sheriff (Tactical)

STARCOM21 has seven repeater sites in the county, located in Crystal Lake, Hampshire, Hartland Township, Harvard, McHenry, Union and Woodstock. Frequencies in use are 851.3500, 851.7375, 852.5500, 853.0375 and 853.3125 MHz. Remember that STARCOM21 is a fully digital APCO Project 25 trunked system, so you will need a newer digital-capable scanner to properly track conversations.

Decimal	Hex	Description
1101	44D	Sheriff (Dispatch)
1102	44E	Sheriff (Statewide)
1103	44F	Sheriff (Car-to-Car)
1104	450	Sheriff (Tactical 1)
1105	451	Sheriff (Tactical 2)
1106	452	Sheriff (Tactical 3)
1107	453	Sheriff (Administrative)
1108	454	Sheriff (Command)
1109	455	Sheriff (Detectives)
1110	456	Sheriff (Investigative Surveillance)
1111	457	Sheriff (Narcotics)
1112	458	Sheriff (Narcotics Surveillance)
1113	459	Sheriff (SWAT)
1114	45A	Sheriff (Gangs)
1127	467	McHenry Police (Dispatch)
1128	468	McHenry Police (Statewide)
1129	469	McHenry Police (Car-Car)
1130	46A	McHenry Police (Tactical)
1132	46C	Bull Valley Police (Dispatch)
1133	46D	County Conservation Police (Dispatch)
1134	46E	County Coroner
1135	46F	County Courts
1136	470	Holiday Hills Police (Dispatch)
1137	471	Hebron Police (Law Dispatch)
1138	472	Lakemoor Police (Dispatch)
1139	473	Prairie Grove Police (Dispatch)
1140	474	Richmond Police (Dispatch)
1141	475	Spring Grove Police (Dispatch)
1142	476	Wonder Lake Police (Dispatch)
1143	477	County Fire (North Dispatch)
1144	478	County Fire (Statewide)
1145	479	County Fireground
1147	47B	Hebron Fireground
1148	47C	Richmond Fireground
1149	47D	Spring Grove Fireground
1150	47E	Wonder Lake Fireground
1151	47F	County Emergency Management Agency (Main)
1152	480	County Emergency Management Agency (Statewide)
1154	482	County Emergency Management Agency (Car-to-Car)
1155	483	County Emergency Management Agency (Tactical 1)
1156	484	County Emergency Management Agency (Tactical 2)
1157	485	County Emergency Management Agency (Severe Weather)
1158	486	County Emergency Management Agency (Search-and-Rescue)
1159	487	County Health Department
1160	488	County Animal Control
1161	489	County Department of Transportation (Dispatch)
1162	48A	County Department of Transportation (Signs)
1163	48B	County Department of Transportation (Superintendents)
1164	48C	County Department of Transportation (Highway)
1165	48D	County Department of Transportation (Vegetation)
1166	48E	County Department of Transportation (Engineering)
1167	48F	Incident Command (Countywide)

Even with STARCOM21 active in the county, you may still find traffic on some of the old VHF frequencies:

Frequency	Description
37.98	County Roads
150.790	County Fire
151.2575	County Fire (North Dispatch)
151.340	County Conservation District
154.250	County Fire (South Dispatch)
154.400	County Fire
154.995	County Operations
155.025	County Animal Control

Other frequencies that can be heard in Cary include:

Frequency	Description
45.36	Emergency Management Agency Operations
45.44	Illinois Emergency Management Agency
155.025	Emergency Management Agency (statewide)
472.1375	Pace Public Mass Transit And Paratransit Buses

Local hospitals in McHenry County can be heard on the following frequencies:

Frequency	Description
451.3125	Woodstock Memorial Medical Center Maintenance/Security 1
451.4125	Woodstock Memorial Medical Center Maintenance/Security 2
451.4375	Harvard Memorial Hospital Operations 1
451.8625	Harvard Memorial Hospital Operations 3
452.1375	Northern Illinois Medical Center Admin/Maintenance/Security
452.5125	Woodstock Memorial Medical Center Maintenance/Security 3
457.5375	Harvard Memorial Hospital Operations 2
464.3250	Northern Illinois Medical Center Admin/Maintenance/Security
464.9125	Woodstock Memorial Medical Center Maintenance/Security 4

❖ MABAS

The Mutual Aid Box Alarm System (MABAS) is an association of hundreds of local fire departments in northern Illinois and southern Wisconsin, providing assistance to member departments in times of emergency or disaster. MABAS may also be used for large fires or significant accidents, where units from multiple departments respond to a single incident.

More than 1,500 agencies and 2,500 engine companies are members, as well as 1,100 ambulances and hundreds of other emergency vehicles. MABAS also makes available specialized response units, including Technical Rescue, Underwater Rescue and Recovery, Urban Search and Rescue, and Hazardous Materials Operations.

All MABAS members have agreed to use common procedures and terminology, allowing different units to work together with relatively little difficulty. This planned and well-practiced interoperability is enhanced by the on-scene use of specific radio frequencies, identified by color, as listed below:

Frequency	Description
150.790	MABAS Fireground Green
153.830	MABAS Fireground Red
153.8375	MABAS Fireground Gold
154.2725	MABAS Fireground Black
154.280	MABAS Fireground White
154.2875	MABAS Fireground Gray
154.295	MABAS Fireground Blue

Several frequencies are also set aside across the state to coordinate operations:

Frequency	Description
154.265	Interagency Fire Emergency Radio Network (IFERN, statewide)
154.3025	Interagency Fire Emergency Radio Network 2 (statewide)
155.280	Illinois Department of Public Health (statewide inter-hospital)
155.400	Ambulance-to-Hospital Communications

That's all for this month. Go outside and enjoy the summer, but if you do find yourself near a computer you can check my website at **www.signalharbor.com** for more detailed information on weather services, scanners, frequencies and other radio-related material. I also welcome your comments, questions and reception reports via electronic mail at *danveeneman@monitoringtimes.com*.

Until next month, stay cool and happy scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
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Correction

In our July column, I proposed a number of ways that a superheterodyne receiver comes up with the intermediate frequency (IF) by mixing the input signal with the oscillator frequency. The explanation was correct, but the mathematical examples I gave were not (After all, Bob, it's simple addition and subtraction!). A number of sharp-eyed readers found the two errors. I guess my calculator needs new batteries, or maybe I do!

In high-side injection, when you add the 150 MHz received signal to the 160.7 MHz oscillator frequency, you get 310.7, not 311.7 MHz. And in the second example (low-side injection), you would add 150 MHz plus 139.3 MHz, not 139.7, to get 289.3 MHz.

But in either example, it's their difference frequency (10.7 MHz) that you finally work with for the IF.

Q. *I recently noticed that if I inserted just one test prod from my digital voltmeter into the hot pin of an AC wall socket and let the other dangle, I would get a reading of several volts. If I touched the second prod with my fingers, the reading was higher. Why was I getting a reading, and what would happen if I touched the other prod to a large metal surface like a car body? (MB, Indiana)*

A. While we could make an analogy that the DVM was acting like a 60 Hz receiver connected to a dipole antenna (the two test prods), indicating the electrical potential of the field radiated by the power line, a more likely explanation would be that you were measuring the electrical potential between the hot wire of the AC line and whatever minute return there could have been between the humid air and common ground for the AC system.

When you held the second prod with your fingers, or connected one prod to the car body, you would have had a higher reading because the area of your skin and the car body coupled more energy into the system, plus you increased the conductivity to the ground return through your shoes soles and the car tires.

I doubt that an older analog voltmeter (VOM) would have shown as high a reading because its lower resistance would have caused a voltage drop by demanding more current to flow to activate the meter; modern digital voltmeters (DVMs) don't require much current to respond with their reading.

Q. *Can a spark occur in a complete vacuum? Would you see or hear it? Would more or less voltage be required to produce it? (Mark Burns, IN)*

A. Yes, but you wouldn't see it or hear it because the light is produced by the fluorescence of the ionized gas (typically nitrogen in air, making it blue), so if there's no gas present, there's no ionization and, thus, no light. Nor is there sound which is produced by the rapid expansion of gas or air, which is also needed to carry a sound wave to be heard.

If you do hear a sound from a spark in a vacuum, it would be produced by mechanical movement in the current-carrying wiring outside the vacuum chamber.

Electrons will still flow, but more voltage would be needed to produce the spark, since even the high resistance of air is more conductive than no air at all.

Q. *It's been years since I've used my Radio Shack DX-398 portable shortwave radio on camping trips where I attached a wire antenna. Now it sounds badly distorted, with a tone in the audio, and signals are very weak. I have used new batteries fresh out of the package as well as the AC adapter. The display and clock and other functions work properly. Any suggestions? (Richard Ashley, N5IZC, Salt Lake City, UT)*

A. Plug in headphones to see if the speaker might have become warped, thus producing the distortion. So far as reduced sensitivity, that often happens (or used to) to portables from strong signal overload. It burns out the first RF transistor. Another possibility is corroded or bent contacts in the external antenna jack.

Are AM and FM broadcasters as weak as SW stations? Keep in mind that SW stations (especially higher in frequency – above 11 MHz) have been weak or absent for several years because of the sunspot cycle. But if AM and FM stations are equally distorted, that would point to the audio circuitry.

Q. *I would like to connect my ICOM R7000 and my Yaesu FRT-9600 to a discone antenna. Should I use a two-position antenna switch or a two-way splitter? (Brock Gorman, email)*

A. The main advantages of the switch would be much greater isolation between the receivers, thus minimizing any oscillator radiation from one getting into the other; and complete, no-loss signal strength from the antenna to the receiver of your choice, assuming the switch is lossless at the higher UHF frequencies.

The splitter may provide enough receiver-to-receiver isolation, but you will lose 2-3 dB since the original signal voltage is now divided in half to feed both receivers.

Q. *Before the advent of digital TV, I had little interference on my analog TV; if lightning was close, I'd see a little flicker. Now that I have a digital VHF/UHF TV, it doesn't matter if the sky is clear or pouring down rain, the picture goes crazy. It pixelizes, freezes, drops out and audio and video get out of sync.*

I am using an indoor loop. My girlfriend has Direct TV and ever since the digital craze, her TV reception has the same problems even with a clear blue sky or a dark, clear night. For me, the worst is from the Alabama Public Television channel. Why is the digital signal having problems when the weather is perfect? (Tom Trott, Mobile, AL)

A. It isn't just weather that interferes with reception; off-centered antennas, tree foliage, local interference signals, electrical noise interference, and just weak signal reception can have a deleterious effect.

When analog pictures are missing a tiny bit of signal, it is difficult to notice, but there is so much information accompanying a digital transmission that the omission of a digit or two can have catastrophic effects on the picture. Freeze-framing is a first symptom, then pixilation, and finally a blank screen – all symptoms of interference that barely affected analog reception.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. Mail your questions along with a self-addressed stamped envelope in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.)

UTILITY WORLD

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Monitoring World Trouble Spots

Sometimes it just feels as if the whole planet is having a bad mood all at once. Spring of 2010 was certainly like that. At least there was something to hear on the radio from all this, so let's take a look.

❖ E10 and Gaza Tensions

On May 30, a fleet of six ships departed from Turkey with supplies bound for Gaza. Due to its ongoing blockade, Israel typically intercepts these ships well out at sea.

Things came to a head the next day, May 31, when the largest ship was boarded by Israeli troops. This led directly to a highly disputed series of events that left nine dead and dozens wounded.

The subsequent diplomatic firestorm had an interesting effect on the Israeli Intelligence "numbers" broadcasts. These are the ones referred to in the hobby as E10, also known as the "Phonetic Alphabet Station." The E10 designation comes from ENIGMA2000, the online incarnation of the European Numbers Information Gathering and Monitoring Association. In their classification system, E stands for "English," which is the language used on-air.

E10 gives the Cubans a run for the prize as the world's biggest numbers operation. Israel uses a unique format, with a female computer voice repeating an identifier of three letters in military phonetics, followed by a "2" if there is no message following. Messages are introduced by a group count. They proceed in 5-letter groups, with the letters also given phonetically. The different identifiers tend to appear in well-defined time and frequency slots, many of which have lasted years.

The emission is often rather distinctive, being upper sideband with a reinserted, reduced carrier to facilitate tuning on simple, portable radios. The international designation for this mode is R3E. Also, the voice is recognizable from its rather weird pronunciations of the phonetics, such as "Novembair" and "Os-CAR" (rhymes with "NASCAR").

Following the May 31 incident, E10 fell completely silent for a period of about ten hours. Logging its transmissions is something of a hobby within a hobby, with several dedicated people keeping track worldwide. No one heard anything at all.

Band conditions at the time were very bad due to a magnetic storm. Even so, it's hard to blame the space weather here. There should have been occasional reports of weak, fading signals. But there was nothing.

When E10 came back, activity slowly ramped up. Some recently silent message slots became active again. Some altogether new messages came out, all at once. One, in the Yankee Hotel Foxtrot slot made famous by the band Wilco, ran 159 groups. This is far longer than normal. It was replaced after five days by a more typical one.

E10's reboot would seem to support the popular theory that Israeli leadership was caught off guard by this incident. It does indeed suggest that somebody dropped back and punted, as they say in American football. Once new instructions were available, they came out all at once. If nothing else, this should be more evidence that "numbers" are still a serious business, with real messages for real spies.

The following frequencies, grouped by identifier, were used in this flurry of activity. They are in kilohertz (kHz).

ART ("Alpha Romeo Tango"): 2456, 2844, 3415, 4270, 5435, and 6986. **EZI** ("Echo Zulu India"): 6840, 7690, and 9130. **PCD** (Papa Charlie Delta): 3150, 4270, and 6498. **ULX** (Uniform Lima X-ray): 4880. **YHF** (Yankee Hotel Foxtrot): 2844 and 3840.

❖ Korean Peninsula

While the Middle East gets most of the media attention, the Korean Peninsula may well be the scariest place on Earth right now. Tensions have run hot and cold there ever since the 1950 Korean War, which ultimately involved China, the United States, and the United Nations. Considerable cooling occurred in the 2000s, but now it's back to a full boil.

As everyone knows, there are two Koreas, faced off across a demilitarized zone (DMZ) around 38 degrees north. These are the Democratic People's Republic of Korea (DPRK), usually known as North Korea, and the Republic of Korea (ROK), known as South Korea or just Korea.

Technically, these countries are still at war, having negotiated only a shaky armistice in 1953. No formal peace treaty was ever signed, and right now DPRK claims to have withdrawn from this armistice.

Signals from Korea are usually quite audible on the US West Coast, especially early in the morning. There's another path, however, which frequently produces good, listenable signals in Europe. The loudest stations are, of course, the large international short wave broadcasters maintained by both sides.

Korea is also a traditionally fertile region for clandestine stations and psychological warfare operations. These are undoubtedly picking up considerably at present. The region's geography does not require extreme coverage, but we still have a possibility of some great listening catches.

The North

On the radio, DPRK is the last of the Cold War propaganda mills. It continues to operate The Voice of Korea, formerly Radio Pyongyang, with a full schedule of shortwave broadcasts in many languages. These tend toward patriotic music, praise of Dear Leader, and the usual old-school political screeds about Western imperialist plots.

For a long time, the Radio Pyongyang transmitters were also used for frequent numbers transmissions (ENIGMA V15). These loud broadcasts, containing revolutionary marches and encrypted messages in 5-figure groups, were heard worldwide until their abrupt cessation at the end of 1999. A Morse code schedule (M40) persisted until 2002. It will be interesting to see if the renewed tensions bring any of these back.

DPRK's news, such as it is, comes from KCNA, the Korean Central News Agency. Using the radio call sign of HMF, KCNA used to entertain utility fans daily over six radio teletype (RTTY) frequencies. These produced hours of truly demented conspiracy theories, sublime thoughts from Dear Leader, and general weirdness. It often seemed to come from a different planet. Alas, this too dropped off in the 2000s, leaving only a web site in Japan. So it goes.

Partially as a response to KCNA's broad-

sides, the United States Congress began funding a Korean-language service on Radio Free Asia in 1997. RFA is like the better known Radio Free Europe. It targets a number of countries, sometimes encountering jamming. In 2008, KCNA called it the "Reptile Broadcasting Service."

Some DPRK utilities remain. The foreign ministry communicates with its embassies in a peculiar teleprinting scheme often called "600/600," for baud rate and shift. It's also known as DPRK-ARQ (Automatic Repeat reQuest, an error-checking protocol).

This traffic is all over the bands, and frequencies change a lot. Here are some hits from the past year: 6747.0, 6758.5, 8529.0, 8737.5, 10258.5, 12108.5, 12202.5, 13378.5, 13458.5, 13533.5, 14327.0 (NOT a good spot!), 14548.5, 14630.5, 14658.5, 15857.0, 15848.5, 15999.5, 16119.5, 16497.0, 16858.5, 18046.5, and 18253.0 kHz.

A maritime coastal station, HML, appears in lists, but it is never reported. Its status is unknown.

The South

As a more normal sort of country, the ROK is a much easier hunting ground for utilities. Its maritime coastal station is still very much with us, in plain old CW (Continuous Wave) Morse telegraphy. It's currently part of Korea Telecom, using several call signs in the HLx range. Yes, it will QSL (acknowledge reports).

Recent hits include: 8484.0 (HLG), 12843.0 (HLO), 12916.5 (HLF), 12923.0 (HLW), and 12935.0 (HLG). All of these are listed as Seoul Radio, though transmitter locations vary.

HLL, Seoul Meteorological Radio, broadcasts a full schedule of weather faxes on 3585.0, 5857.5, 7433.5, 9165.0, and 13570.0 kHz. These use the standard 120 lines per minute and 576 Index Of Cooperation, with the 1.9-kHz offset on USB radios. The charts are copied pretty much daily in California.

There's also a South Korean numbers station, ENIGMA V24, in amplitude modulated (AM) voice. This one appears on the hour, and sometimes the half hour. It follows the typical Asian format, with music and chatty female voices saying "Please" and "Thank you" to the spies.

V24's most often reported frequency is 6215.0 kHz. Other places to listen are 4500.0, 4600.0, 4940.0, 5500.0, 5715.0, and 6715.0 kHz. A California listener recently heard 5715 active at 2200 Coordinated Universal Time (UTC). It's a nice catch at that hour.

In May, for the first time since 2004, the ROK very briefly resumed its own FM-band propaganda broadcasts into the north. DPRK still requires that all of its entertainment radios be modified to prevent any reception of the "reptiles." However, an unknown percentage of the people use smuggled Chinese sets or illegal "jailbreak" mods to receive "out of band." In addition, past ROK psyops were known to drop in cheap portables, or "broadcast" audio programs through banks of powerful loudspeakers. This din was audible miles north of the DMZ under the right conditions.

Keep fingers crossed on this crisis, and see you next month.

ABBREVIATIONS USED IN THIS COLUMN

AFB	Air Force Base
ALE	Automatic Link Establishment
AM	Amplitude Modulation
CAMSLANT	Communications Area Master Station, Atlantic
CAP	US Civil Air Patrol
COTHEN	US Customs Over-The-Horizon Enforcement Network
CW	On-off keyed "Continuous Wave" Morse telegraphy
DSC	Digital Selective Calling
E10	Israeli female phonetic calls and 5-letter group messages
E11	"Strich" ("Oblique") family, female English voice
EAM	Emergency Action Message
FAX	Radiofacsimile
FEMA	US Federal Emergency Management Agency
HFDL	High-Frequency Data Link
HF-GCS	High-Frequency Global Communication System
LDOC	Long-Distance Operational Control
LSB	Lower Sideband
M08a	Cuban CW/MCW numbers, cut to ANDUWRIGMT
MARS	US Military Auxiliary Radio System
MCW	Modulated CW, tone or AM
Meteo	Meteorological Office
MFA	Ministry of Foreign Affairs
MX	Generic for Russian single-letter beacons/ markers
NASA	US National Aeronautics and Space Administration
NAT	North Atlantic oceanic control, families A-F
NDB	Non-Directional Beacon
PR	Puerto Rico
PSK	Phase-Shift Keying
RTTY	Radio Teletype
S30	Russian military "Pip" marker, multitone beeps
Selcal	Selective Calling
SHARES	SHAred RESources, US Federal frequency pool
SITOR	Simplex Telex Over Radio, modes A & B
STANAG	STAndardization AGreement
STANAG 4285	Military 8-state PSK radio modem
UK	United Kingdom
Unid	Unidentified
US	United States
USAF	US Air Force
USCG	US Coast Guard
V02a	Cuban "Atencion" numbers, 3-message format
Volmet	Scheduled aviation "Flying Weather" broadcast

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in ().

327.0 MVC-NDB, Merville/Calonne, France, MCW at 0522 (Ary Boender-Netherlands).
350.0 ROT-NDB, Rotterdam, Holland, MCW at 0529 (Boender-Netherlands).
352.0 LAA-NDB, Niedderrhein, Germany, MCW at 0529 (Boender-Netherlands).
1888.0 IPD-Civitavecchia Radio, Italy, maritime weather in Italian, at 2034 (MPJ-UK).
2142.5 ZLST-German Customs, Cuxhaven, calling ZHOH (Cruiser Hohwacht), also on 2673 and 3831, ALE at 1919 (MPJ-UK).
2207.0 ZLM-Taupo Radio, New Zealand, maritime weather, also on 4146, 6224, 8297, 12356, and 16531; at 0333 (Eddy Waters-Australia).
2899.0 Shanwick Radio-NAT-A, Ireland, working Delta flight DL34, at 0257 (Ken Maltz-NY).
3181.0 RMP-Russian Navy, Kaliningrad, CW storm warning at 1855 (MPJ-UK).
3390.0 NNN0JOP-US Navy/ Marine Corps MARS, SC, Region 4 Net at 0106 (Mark Cleary-SC).
3485.0 New York Volmet, also on 10051 and 13270, North Atlantic aviation weather at 1102 (Jim W4JBM-GA).
3595.0 ZKNI-German Customs Cruiser Kniepsand, working ZBOR, Cruiser Borkum, ALE at 0723 (Michel Lacroix-France).
3638.0 RCV-Russian Navy, Sevastopol, plain and encrypted CW with vessel RHV42, at 2027 (MPJ-UK).
3756.0 "The Pip"-Russian military channel marker (S30), weird MCW at 2107 (Boender-Netherlands).
4038.5 NNN0AGV-US Navy/ Marine Corps MARS, SC, state net at 0019 (Cleary-SC).
4079.61 "TMP"-Pirate CW temperature beacon, sending "TMP 73" (Fahrenheit), at 0241 (Hugh Stegman-CA).
4089.2 Unknown pirate CW beacon, CA, 80 dashes per second, at 0243 (Stegman-CA).
4094.4 "PA"-Pirate CW beacon, AR, weak at 1042 (Jim-GA).
4096.27 "Hexie"-Pirate CW dasher beacon, CA, weak at 1044 (Jim-GA).
4096.61 "Kelsie"-Pirate CW dasher beacon, CA, weak at 1046 (Jim-GA).
4097.08 "Inyo Whooper"-Pirate CW dasher beacon, Inyo County, CA, whoopy frequency drop, at 0223 (Stegman-CA).
4097.55 "KX"-Pirate CW beacon, weak at 1048 (Jim-GA).
4097.76 Unknown pirate CW beacon, slow dashes at 0228 (Stegman-CA).
4102.3 "W"-Pirate CW wind beacon, CA desert, sends W plus dits for wind speed, at 0231 (Stegman-CA).
4102.75 Unknown pirate CW beacon, slow dashes at 0234 (Stegman-CA).
4109.0 RHY47-Russian Navy vessel, calling RMP (Kaliningrad), CW at 0845 (ALF-Germany).
4150.0 "V"-Russian military channel marker (MX), Khiva, CW at 2110 (Boender-Netherlands).
4152.5 DRDR-German Navy submarine, calling DHJ59 in German, then into STANAG 4285, at 0510 (Lacroix-France).
4209.5 TAH-Istanbul Radio, Turkey, SITOR-B marker at 0303 (Maltz-NY).
4238.4 FUE-French Navy, Brest, STANAG 4285 traffic for FAKB, at 1403 (MPJ-UK).
4325.9 "R"-MX marker, Izhevsk, CW at 2108 (Boender-Netherlands).
4469.0 Georgia CAP 41-Georgia Net, with Down East 16, at 0007 (Cleary-SC).
4490.0 NCS015-US National Communications System, calling NSFHQ1 (unknown), ALE at 1133 (MDMonitor-MD).
4500.0 AFA4RY-USAF MARS, Region 4 Net at 0010 (Cleary-SC).
4558.1 "A"-Russian CW cluster beacon (MX), Astrakhan or Baku, also on 5154.1, 7039.1, 8495.1, 10872.1, 13528.1, and 16332.1; at 0453 (Waters-Australia).
4585.0 Unid-Virginia CAP Net, roll call in progress at 1131 (Cleary-SC).
4614.5 UHC-USCG Cutter Decisive, ALE sound at 0122 (Cleary-SC).
4721.0 170041-USAF C-5B, ALE sound at 1419 (Cleary-SC).
4780.0 Golden Pirate-Indiana Joint Forces North Region Net, checking in many stations, LSB at 1302 (Jack Metcalfe-KY).
4924.9 MRX45-UK military cadets, working MRW at 0853 (Lacroix-France).
5060.2 WGM-CruiseEmail Southern Node, FL, CW identifier at 0240 (ALF-Germany).
5258.0 BP23-German Police Boat Bad Dueben, calling BPLEZS (headquarters), ALE at 0458 (PPA-Netherlands).
5435.0 Israeli phonetic numbers (E10), AM 5-letter group message in progress, at 1937 (Lacroix-France).
5450.0 Royal Air Force Volmet, UK, aviation weather at 0048 (Cleary-SC).
5541.0 SDJ-Stockholm Radio, Sweden, selcal HK-LM to World Airways flight 8010 (DC-10, N136WA), departing Ramstein Air Base at 1857 (PPA-Netherlands).
5544.0 A4-ODA-Oman Air A330, HFDL log-on with Muharraq, Bahrain, at 2238 (MPJ-UK).
5598.0 Gander-NAT-A, Canada, unable higher altitude for Canforce 4115, at 0135 (Prez-MD).

5598.0 Santa Maria Radio-NAT, Azores, selcal CR-HQ for Lufthansa 461, an A340 registered D-AIFF, at 0124 (Maltz-NY).
5680.0 Kinloss Rescue-UK Air Rescue, Scotland, working Navy 193 and 177, at 1052 (MPJ-UK).
5810.0 Cuban "Cut Number" station (M08), audio tone, then MCW callup UIDUA and message, at 0510 (PPA-Netherlands).
5883.0 Cuban Spanish numbers (V02a), AM 5-figure group message in progress, at 0711 (Lacroix-France).
5909.5 MEMPRI-COTHEN primary remote transmitter, TN, ALE sound at 0200. ABQ-PRI, NM, sounding at 0230. OKOPRI, OK, sounding at 0630 (MDMonitor-MD).
6326.5 RLK7-Archangelsk Radio, Russia, SITOR-B traffic list at 1802 (PPA-Netherlands).
6435.5 HEB-Global Link, temporarily on Berne transmitter, repeating old-school Hayes modem commands in SITOR-B, at 2115 (MPJ-UK).
6610.0 Flight Watch-Australian regional domestic air control, Charleville, also on 8843, at 0720 (Waters-Australia).
6661.0 N29124-Continental Airlines B757, flight CO1037, HFDL position for Riverhead, NY, at 2330 (MPJ-UK).
6676.0 Singapore Volmet, aviation weather at 1821. Mumbai Volmet, India, at 1826 (PPA-Netherlands).
6679.0 Honolulu Volmet, Pacific aviation weather at 1110. Tokyo Volmet, West Pacific weather at 1120 (Jim-GA). Hong Kong Volmet, aviation weather at 1816 (PPA-Netherlands).
6754.0 Trenton Volmet-Canadian Forces, ON, aviation weather at 1056 (Jim-GA).
6765.0 KPNN491-American Red Cross, checking into the SHARES Northern Net, at 1624 (Metcalfe-KY).
6767.0 OPMHQ1-Unknown US agency, working OPMHQ2, also on 9064, ALE at 2052 (Metcalfe-KY).
6777.2 DHJ59-German Navy, Wilhelmshaven, raised DREW, Mine Hunter Groemitz, then to STANAG 4285, at 0618 (Lacroix-France).
6838.0 ABA-Unknown military, passing ALE message "/>A2001" to A2A, at 0301 (ALF-Germany).
6840.0 EZI2-Israeli Phonetic Station (E10), null-message identifier only, at 1803 (PPA-Netherlands).
7000.0 HQ3-Great Man-Made River Authority, Benghazi, Libya, calling GHADAMES (possibly Ghadamis water well field), ALE at 1953 (ALF-Germany).
7402.0 Unid-Russian Air Defense, auto-formatted CW tracking strings at 0855 (ALF-Germany).
7527.0 LNT-USCG CAMSLANT, ALE and voice with N02 (HC-144A, not heard), at 0112 (MDMonitor-MD). HSD-USCG Cutter Drummond, calling Z12 (Sector Miami, FL), ALE at 1446 (Cleary-SC).
7597.0 BP26-German Police Boat Eschwege, working BPLEZS, Cuxhaven headquarters, ALE at 1418 (MPJ-UK).
7632.0 WGY904-FEMA Region 4, GA, checking into SHARES weekly net, at 1605 (Cleary-SC).
7635.0 Georgia CAP 41-National Net, with Middle East 34 and Goldenrod 595, at 1404 (Cleary-SC).
7831.0 FAV22-French Morse code practice, CW drill messages at 0555 (Lacroix-France).
7998.5 34B-Unknown, ALE link checks and follow-on PSK data exchange with 33E; also 30E and D02, at 0318 (ALF-Germany).
8000.39 Unknown pirate CW beacon, possibly "S" but sending only dits, at 0247 (Stegman-CA).
8010.0 M08a, CW 5-letter group message, in progress at 0308 (Prez-MD).
8040.0 GYA-UK Royal Navy, Northwood, FAX sea surface analysis at 0158 (Maltz-NY).
8045.0 RFU-Saudi Airfields Status Net, working JCU, ALE at 1956 (MPJ-UK).
8047.0 L060AN-LA Army National Guard, calling HQ703N (Readiness Center, VA), possible oil spill cleanup, ALE at 2345 (MDMonitor-MD).
8161.0 MOBILE4-Possible Western Libyan Gas Project, calling MOBILE7, ALE at 1925 (MPJ-UK).
8280.0 CGA-Venezuelan Navy headquarters, calling 1EW1 (vessel Armario), LSB ALE at 0100 (MDMonitor-MD).
8337.6 Shark 29-USCG Cutter Decisive, clear and secure with Swordfish 17 (HU-25A, Coast Guard 2117) regarding op with Omaha 629 (US Customs), at 2319 (MDMonitor-MD).
8395.0 UAWH-Russian vessel Kapitan Boubnov, sending OBS (weather observation) to an unknown coastal station on 8435, at 1816 (MPJ-UK).
8424.0 SVO-Olympia Radio, Athens, SITOR-B news in Greek, at 1312 (MPJ-UK).
8504.0 NMG-USCG, New Orleans, weak FAX at 0643 (Lacroix-France).
8508.0 RDL-Russian military, CW at 0837 (Waters-Australia).
8625.0 FUM-French Navy, Papeete, Tahiti, STANAG 4285 at 0825 (Waters-Australia).
8682.0 RJF94-Russian Naval Air Transport, Moscow, net control comm checks with RJC48 (Sebastopol, Ukraine), RJC38 (Murmansk), and RCB (Kaliningrad); CW at 0305 (ALF-Germany).
8743.0 HSA-Bangkok Radio, musical Thai voice mirror and bulletin, at 1641 (Lacroix-France).
8764.0 NMO-USCG, HI, "Iron Mike" weather voice at 0615 (PPA-Netherlands).
8825.0 New York-NAT-E, selcal FK-BC to Iberia 6464, A340 reg EC-KSE, at 0525 (PPA-Netherlands).
8885.0 VT-VJL-Kingfisher Airlines A330, flight IT0001, HFDL position for Muharraq, at-1639 (MPJ-UK).
8888.0 Samara Volmet, Russia, aviation weather at 1549 (MPJ-UK).
8891.0 Iceland Radio-NAT-D, volcanic ash warning at 0034 (MDMonitor-MD).
8894.0 Algiers-African air route control Area 2, Algeria, position from Speedbird 765 (British Airways), at 0256 (Prez-MD).
8912.0 07Z-USCG Miami Air Ops, on a search and rescue with 500 (HC-130H, Coast Guard 1500), ALE and voice at 2306 (MDMonitor-MD).
8957.0 Shannon Volmet, North Atlantic aviation weather at 1058 (Jim-GA).
8971.0 Fiddle-US Navy, FL, target tracking with Red Talon 71D (US Navy P-3C), at 2317 (MDMonitor-MD).
8977.0 LY-SKR-Aurela Airlines B757, HFDL log-on with Reykjavik, Iceland, at 1617 (MPJ-UK).
9025.0 ADW-USAF, Andrews AFB, MD, calling GHM (US military "3-letter net"), ALE at 1630 (MDMonitor-MD).
9047.0 0004WICAP-CAP Wing Chief of Staff, WI, calling 0011ARCAP, AR, ALE at 0123 (MDMonitor-MD).
9145.0 RIW-Russian Navy headquarters, Moscow, sending RJQ60 to voice on 17242, with RIW listening on 16360, CW at 1220 (ALF-Germany).
9462.0 FC0FEM004-FEMA Region 10 comm manager, WA, also on 10588 and 14776, ALE at 1840 (MDMonitor-MD).
10027.0 Czech Airlines LDOC, working unknown flight in Czech, also on 13351, at 1514 (Lacroix-France).
10051.0 Gander Volmet, North Atlantic aviation weather at 1450 (Jim-GA).
10057.0 San Francisco-Pacific oceanic air control, position from American 254 at 0228 (Prez-MD).
10063.0 N563AS-Alaska Airlines B737, HFDL position for Panama, at 2300 (MPJ-UK).
10066.0 HS-PGY-Bangkok Air A319, flight BKP103, HFDL position for Hat Yai, Thailand, at 2336 (MPJ-UK).
10087.0 B-6388-Sichuan Airlines A320, HFDL log-on with Krasnoyarsk, Russia, at 1631 (MPJ-UK).
10155.0 CHPNSC141P-AT&T, Chapin, SC, calling several stations in ALE, at 1700 (MDMonitor-MD).
10242.0 Z13-USCG Sector Key West, FL, calling HSD (USCG Cutter Drummond), ALE at 1934 (Cleary-SC).
10588.0 FC0FEM-FEMA Region 10 comm manager, calling OR0FEM, OR Emergency Management, at 2120 (MDMonitor-MD).
10650.0 TT64-Venezuelan Navy vessel Los Llanos, working CGA, Caracas headquarters, ALE at 2154 (PPA-Netherlands).
11030.0 VMC-Charleville meteo, Australia, wind/wave FAX at 1939 (PPA-Netherlands).
11039.0 DDH9-Hamburg/ Pinneberg Radio, Germany, RTTY sea height report, simulkeyed on 14467.3 as DDH8, at 2210 (Maltz-NY). [Deutsche Wetterdienst Program 1 for shipping. -Hugh]
11175.0 Andrews-USAF HF-GCS, MD, with 3 EAMs simulcast on 8992, 13200, and 15016, then twice "standing by for traffic," at 0100 (Jeff Haverlah-TX). Offutt-USAF HF-GCS, NE, telling S4JG to use 11220 for further, at 1258 (MDMonitor-MD). Andrews, several EAMs at 1802 (Jim-GA).
11226.0 277187-USAF C17, tail number 07-7187, ALE-dialed patch via PLA, Lajes, Azores, at 1940 (PPA-Netherlands).
11232.0 Canforce 4101-Canadian Forces aircraft, answered selcal AS-CP from Trenton, at 1954 (PPA-Netherlands).
11300.0 Tripoli-African air route control Area 3, Libya, position from Lufthansa 573 at 0037. Tripoli, working Air France 995 at 0051, and Air France 3575 at 0225 (Prez-MD).
11318.0 CC-CXI-LAN Chile, B767, HFDL position for Santa Cruz, Bolivia, at 2244 (MPJ-UK).
11354.0 VP-BWG-Aeroflot A319, HFDL position for Barrow, AK, at 2305(MPJ-UK).
12356.0 XVG-Haiphong Radio, Viet Nam, duplex with unheard vessel at 1602 (Lacroix-France).
12359.0 XVS-Ho Chi Minh Radio, Viet Nam, all-ships call in English and Vietnamese, at 1634 (PPA-Netherlands).
12431.0 AVALLONE-Italian Coast Guard vessel, working MESSINA (Financial Police) and PRATICA01 (Aviation Command), ALE at 1528 (MPJ-UK).
12577.0 3EHZ-Panama registry vessel Elm Galaxy, calling ECA6 (Madrid, Spain), DSC at 1458 (MPJ-UK).
12725.0 Unid-Possible Brazil Navy, calling BE1 in ALE, at 0032 (Waters-Australia).
12843.0 HLO-Seoul Radio, Korea, CW marker at 1403 (PPA-Netherlands).
12856.0 XSG-Shanghai Radio, China, CW messages in Chinese at 1422 (MPJ-UK).
13285.0 Unid-El Al Airlines LDOC, Israel, working a flight in Hebrew, at 0625 (Lacroix-France).
13303.0 SVA901-Saudia AirlinesB747, HFDL position for Canarias, at 1255 (MPJ-UK).
13312.0 D47-US Customs P-3B, calling D41 (also a P-3B), ALE at 1920 (MDMonitor-MD).
13315.0 N426AV-Avianca A320, flight AV0037, HFDL with Santa Cruz at 0001 (MPJ-UK).
13528.2 "F"-MX, Vladivostok, CW at 1544 (PPA-Netherlands).
13908.0 Unid-"Oblique" numbers station (E11), 5-figure group message in progress at 1738 (Mike-West Sussex, UK).
13927.0 Reaper 76-USAF B-2A, patch via MARS AFA9PF, CA, to Whiteman AFB Meteo, MO, at 1720 (Allan Stern-FL).
14455.0 KHA 945-NASA, AL, weekly radio check at 1650 (Cleary-SC).
14481.7 Unid-Egyptian MFA, Cairo, SITOR-A traffic, also on 14616.7 and 14631.7, at 0441 (Waters-Australia).
14556.0 RIW-Russian Navy, Moscow, calling RDND in CW, at 0632 (PPA-Netherlands).
14582.0 PR1-COTHEN primary remote, PR, calling RS1, unknown COTHEN remote, at 1730 (MDMonitor-MD).
14635.0 T040NN-Army National Guard, TN, calling HQ703N, possible Nashville flood ops, ALE at 1800 (MDMonitor-MD).
14780.0 GWPWN33-Brazilian Navy, Natal, calling GWPWIN (vessel Independencia), ALE at 2250 (MDMonitor-MD).
15094.0 KOG55C-US Federal Bureau of Investigation, Las Vegas, NV, ALE on SHARES net, at 1604 (Metcalfe-KY).
15867.0 November 01-USCG HC-144A, setting guard with CAMSLANT at 2251 (Cleary-SC).
15962.0 Australia Control-Royal Australian Air Force, calling a flight at 0702 (Waters-Australia).
16050.0 FUE-French Navy, Brest, broadcasting traffic to group callsign FAAC, STANAG 4285 at 1130 (Mike Chace-Ortiz-ME). FUE, news in Malaysian to FAAC, STANAG 4285 at 1220 (PPA-Netherlands).
16061.7 Unid-Egyptian MFA, Cairo, listening on 16222 for Nairobi embassy, SITOR-B at 1301 (PPA-Netherlands).
16976.8 JFK-Shimonoseki Fishery Radio, Japan, working vessel in CW, at 0735 (Waters-Australia).
17341.0 SVO-Olympia Radio, news in Greek at 1951 (PPA-Netherlands).
18107.7 HL105KRC-Korean Red Cross, Changwon, special event working TK4LS, RTTY at 1344 (PPA-Netherlands).
24526.0 FC4FEM-FEMA Region 4, calling FC8FEM002, Region 8 comm manager, CO, ALE at 1530. FC1FEM-Region 1, MA, calling NY2FEM, NY Emergency Management, ALE at 1600 (MDMonitor-MD).
25000.0 Unid-Finland Centre for Metrology and Accreditation, Espoo, standard time signals in DCF77 (German) format, at 1136 (ALF-Germany).
26765.0 Unid-11 meter Citizens' Band simplex Internet gateway, Göttingen, Germany, with many stations legally using the net on German channel 61, at 1145 (ALF-Germany).

DIGITAL DIGEST

DIGITAL MODES ON HF

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The Three Best Modes

Regular readers will remember that I put out the call for a few ideas for future columns. We've covered some requests already and I thought that this next suggestion from Sage V would make a great follow-on from the June edition of this column which covered decoding standard Baudot RTTY. Sage asked the following questions:

- *Name the best 3 modes that can be easily identified and processed.*
- *Name the best 3 models of conversion program to do so (needs to be intuitive).*
- *Provide a larger list in the same format as an addition to the above basic 3 modes that can be explored once one gets the "hang of it."*

These are some great questions, so let's see what we can do...

Question No. 1: Which 3 Modes?

Well, "best" is always a subjective term. Here, I'm going to opt for "easiest." We have already covered simple RTTY in the previous column mentioned above and that mode would surely be at number two on my list of three. But first on my list would be the grand daddy of all digital modes, simple on-off keying, aka CW or Morse Code.

Despite dire warnings of the disappearance of CW, it remains widely used by radio amateurs, intelligence "numbers" stations, various coastal stations, and pretty much every time more modern modes can't make it through interference or weak signal conditions.

While it's not truly in the same class as, say, SITOR-A or ALE in terms of being a digital signal, it is very easy to recognize by ear. There is a wide variety of decoding options, and it makes a great signal with which to practice all the things that are important to successful digital decoding, like a stable receiver, correct audio levels and accurate tuning to get good output.

Number three on my list would be MIL-STD-188-141A Automatic Link Establishment or ALE. While this is a relatively complex mode in terms of its construction, it is easy to recognize by ear, easy to tune into, and because it is used to set up other modes like STANAG4285 or MIL-188-110A high speed modems, it makes a great starting place for a signal that reveals more complex modes that listeners can progress to later.

So here's the final list: (1) CW, (2) RTTY and (3) MIL-188-141A ALE.

Question No. 2: Which Decoding Programs?

Again, we're facing with the same challenge as to the definition of "best" in the context of decoding programs. Clearly, all the semi-professional offerings from WaveCom and Hoka cover our three chosen modes and lots more besides, but unless your definition of "best" means comprehensive and expensive, we should probably consider a few more factors.

Here, I'm going to go with cheap (even free) and "easy to use" as the definition for the best decoder to use. That definition also allows us to consider a number of different options that cover each of our three modes. I'm also conscious of the fact that not everyone uses Windows, so it's nice to have some choices for Mac and Linux users, too.

Decoding CW, RTTY and ALE on Windows

I really like Sergei Podstrigailo's CWGet and TrueTTY decoders. Since both programs share the same author, they share the same philosophy, simplicity and many of the same user interface features, such as an effective visual display of the incoming signal to aid with tuning. CWGet focuses solely on CW, while TrueTTY offers decoding of Baudot RTTY (multiple speeds and shifts), 7bit and 8bit ASCII, SITOR-A & B, PSK31 and relatives, a number of MFSK modes and even AX.25 Packet Radio if you have a hardware or software KISS-capable TNC (Terminal Node Controller). As a result, TrueTTY will provide you with the ability to watch the German Weather Service on RTTY, the Egyptian Diplomatic Service on SITOR-A, and many maritime and other stations using SITOR-B.

CWGet offers the ability to listen to a variety of "numbers" stations operated by Intelligence organizations, the Israeli Navy and again, a large number of ships and coast stations. TrueTTY is free to evaluate for 30 days and then $39 (or 33 Euro) to register and unlock. For CWGet, the cost is $35 or 30 Euro.

For ALE, I recommend the software that started it all for us hobbyist listeners: PC-ALE. Though development of Charles Brain's original software now continues through other organizations like HF Link, this is still the most capable and reliable way to start listening to the vast world of MIL-188-141A-equipped stations. The software can also command a large selection of radios directly over a serial connection, so that networks can be continuously scanned without user intervention. Users of this mode include diplomatic, military, MOI, NGO operations and just about everything in between.

Decoding CW, RTTY and ALE on Mac OSX

If you are using Apple's operating system, Black Cat Systems' MultiMode can cover all three of our chosen modes and remains probably the most comprehensive decoding system on the Mac. Apart from our three modes, MM also supports decoding of Globe Wireless idle signals, CHU time signals, VHF ACARS, DGPS, Fax, GMDSS signals from ships in distress, DGPS beacons, PSK31 and SITOR-A & B and more. If you are a licensed radio amateur, MM will also transmit a number of these modes. MultiMode currently costs $89 to register. I find it works best when fed with a Griffin iMic that converts your radio's audio to USB data (see the June 2010 column for details).

If you are an Apple iPad user, you may be interested to know that Chris Smolinski, MM's author, is rumored to be working on a version of MultiMode for this exciting new device. Audio can be piped into the iPad by using the Camera Adapter and connecting a Griffin iMic to the USB port.

Decoding CW, RTTY and ALE on Linux

If you are a fan of Linux, the free fldigi is a great choice for decoding CW and RTTY. The software also runs on Windows and Mac OSX, so if you jump between different machines a lot, fldigi offers a way to keep your decoding suite familiar. Like TrueTTY, fldigi is mainly aimed at radio amateurs, and also supports a large number of more exotic modes like Olivia, Contestia, Hellschreiber, MT63 and Domino.

I'm not aware of any native ALE decoders for Linux, but I do know that some users have reported successfully using Windows software under the free VirtualBox and Wine software that emulates a Windows machine in Linux. I did find a project in the planning stage, Open-ALE, that appears to be aimed at building a native decoder, but no software is available yet.

Question 3: Provide a larger list of modes that users can progress to.

Well, as you've probably noticed above, all of the chosen decoders have more to offer besides our chosen three modes. All represent a cost-effective way to use your experience in a few simple modes to progress to others that can all regularly be heard on the HF utility bands.

Until next month, enjoy your digital listening and please keep the ideas coming for new columns and items of interest to cover in future editions.

RESOURCES

CWGet	**www.dxsoft.com/en/products/cwget**
TrueTTY	**www.dxsoft.com/en/products/truetty**
PC-ALE	**http://hflink.com/pcale/**
MultiMode	**www.blackcatsystems.com**
Fldigi	**www.w1hkj.com/index.htm**
Open-ALE	**http://sourceforge.net/projects/open-ale/**

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A Ham Radio Camping Upgrade

Those of you who have followed this author's humble scribblings (keyboardings?) over the years know that I enjoy the outdoors. I hike, cycle, kayak and generally enjoy playing in the woods, as does my XYL. I have also been a great cheerleader for taking amateur radio out on my various outdoor adventures, promoting the efforts of organizations such as The Adventure Radio Society **http://adventure-radio.org/wiki/index.php?title=Main_Page** and other groups that take radio out of the shack and into the world.

A couple of recent developments have given me the opportunity to take this outdoor ham radio stuff in a new direction. First, my XYL and I decided to "move up in the world" and go from tent camping to something a little less primitive, at least when we are not traveling down river by kayak. We purchased a Columbia Northwest Inc. A-Liner, hard sided "pop-up" camper. This type of camping is only a step or so up from tent camping. It is light enough to be pulled by our fuel efficient Subaru Baja, while keeping with our low impact lifestyle as much as possible. The A-liner will become our base of operations for many adventures brought about by our next lifestyle change.

The XYL and I have decided to take early retirement from our "real world" jobs to, as they say, "pursue other interests." She will be going into limited private practice in her craft and I will continue to explore writing, speaking, figuring out the world around me, and sharing my findings in productive (and hopefully profitable) ways. That high falutin' sounding statement translates into "Hey! We want to play more and work less!" We've been ants long enough. We want to be grasshoppers now!

So, once we picked up our camper trailer from the dealer, I quickly went into ham radio mode, trying to figure out the best way to play radio while off down the road. These notions may influence your decisions about taking amateur radio with you when you travel.

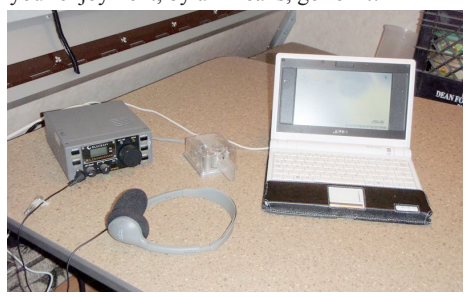
❖ Not all Campsites are Equal!

One of the advantages of "primitive" tent style camping or backpacking is that all you need is a piece of dry ground and a tree to suspend your foodstuffs away from critters to make a campsite. You can walk into the woods as deep as you want to and go as native to the environment as your wits and equipment will take you. Some of the best amateur radio fun can be had backpacking into a remote area and tossing a wire into the trees, operating with a watt or two from a small battery pack. You are miles from manmade noise sources and the bands are as quiet as they can be. If you have the interest, it is well worth the effort.

Trailer camping can still take you "off the grid," especially if your camper is rigged for DC power, but, in general, trailer style camping rigs do their best work in "groomed" campsites. One of the things that influenced our choice was the great number of public and private campgrounds available near places we like to kayak, hike and mountain bike. Cheaper than a hotel, they are still a touch more civilized than living out of a tent.

We rigged our A-liner with a "Triple Power" voltage converter. This is a microprocessor controlled unit that checks available power sources (the car's battery/generator, the trailer's on board deep cycle battery, and available AC "mains" power from the campground). The unit automatically picks the most logical power source under the given conditions, and recharges the on board battery when juice is coming from an outside source, keeping everything topped off and ready.

As a ham, when choosing a campsite, you will most likely want to pick a site based upon power availability. This usually costs a few dollars more, but may be well worth it for radio and other fun. Deluxe camping facilities that cater to larger Recreational Vehicles will have power, water, sewer, even phone, cable TV and Internet connectivity. You won't exactly be roughing it at such a site, but if those utilities are essential to your enjoyment, by all means, go for it!



The Elecraft K1 and the Asus eeePC make a great simple station for campsite operation.

❖ Pick Your Rig

I am a QRP guy. I never need more than a trickle of power to play radio. As a matter of fact, in last August's column, I mentioned setting up my Elecraft K1 for kayak camping. This setup has served me well, so it seemed like a perfect way to take ham radio along in the A-liner as well. I can run the K1 off its internal battery pack, the trailer's onboard DC, or from the campsite AC using nothing more than a 800 mA "wall wart." I could probably go "key down" for many weeks before I would exhaust the onboard deep cycle battery at the power levels I like to run.

On the other hand, any similarly equipped trailer or RV would probably play nicely with any of the currently popular mobile/portable HF transceivers. A system outfitted in this way has the capacity to keep an operator happy up into the 100 watt range or better if they keep an eye on power consumption.

In addition to operating HF, I carry a 2 meter handi-talkie and base charger. I pre-program the talkie for repeaters along the road to and from the campsite, as well as any machines local to the camping area. Sure, I can talk with local hams and get their input, but this also ensures I'm prepared to put out a call for help in an emergency.

❖ Antennas – Decisions, Decisions, Decisions

For years, my woodland radio operation has benefitted from an antenna system no more complicated than a random length of wire tossed up into a nearby tree. Entering the world of more formal campsites forced me to rethink this seemingly practical antenna system in favor of something, again, just a bit less primitive.

A mobile HF whip is a simple solution to campsite antenna limitations

You see, "groomed" campsites are often well regulated and your site is likely to have neighbors all around, enjoying their camping pursuits as well. Tossing a wire into a tree, even if you take steps to prevent "clotheslining" the folks at the next campsite over, will likely be frowned upon. It was time to check the basement to see what I had handy.

I had a "mag mount" base and a couple of mobile HF whip antennas for 20 and 40 meters. I used to use these to operate from my car during my lunch break when it was convenient. This looked like a good place to start. One small problem, though; my A-Liner trailer, being radically lightweight in design, is more fiberglass than metal. A good ground plane is usually needed to get HF whips to radiate well.

Back in the workshop with the antenna, I disassembled the base until I found the ground braid. To this I added a nut and bolt "stud" that stuck out of the base housing, allowing me to attach a

couple of 30 foot "counterpoise" wires. You couldn't run down the road this way, but the ground side wire can be tucked under the camper or shallowly buried on the camp grounds. Once the trailer is set up at the campsite, the mag mount goes on the only convenient metal surface my camper provides, the top of the air conditioner. (Okay, so maybe it is more than a little bit less primitive!)

I pre-adjusted and tuned the whips before leaving home so that the K1's automatic antenna tuner would not have to work terribly hard once I got into the field. As the old timers used to say: "If the darned thing loads… Leave it alone!"

As I get more comfortable with this style of camping, I plan to try some other antenna notions and pass them on to the group down the log. Stay tuned.

Close up of the added counterpoise wires to the mag-mount antenna base discussed above.

❖ When to Operate

When you head out to formally organized campsites, you will discover that folks tend to fall into one of two groups. Those who set up camp, put their lawn chairs out under their tarp, and more or less stay put throughout the time they are camping.

No doubt that's a great way to relax, but my XYL and I fall into the second group. We set up camp, grab our outdoor toy of choice -- be it kayaks, bikes, or sturdy shoes -- and head off to explore, returning only for meals and rest.

The ham who prefers the first type of camping is free to play radio throughout the day and will set up his or her band and antenna choices accordingly. My pattern is usually to get an hour or so on the radio after dinner, before turning in. Late dusk and early evening mean that maybe 20 meters, but more likely 30 and 40 meters are going to be the best places to find a rag chew or two before turning in.

A 30 meter HF whip was quickly ordered from my friendly ham radio supply house. (Note: You are probably spending too much money on ham gear when they call you by name when they answer the phone.) Since my K1 also has a 15 meter band on it, I will probably add a whip for that band as conditions continue to improve through the solar cycle.

There are occasionally "down days" when we are camping due to rain or other negative conditions. If you're stuck in the camper, you may as well play radio, right?

❖ Logging and Record Keeping

I always like to remind folks that hams got along just fine with nothing more sophisticated than pencil and paper since Marconi was a pup. You can make notes and keep track of your contacts with a pen and small notebook. If you want to get more sophisticated, you may want to consider one of the new "netbook" personal computers. They take up very little space and have relatively low power consumption. Other possibilites are Personal Information managers (PIMs) or even a "App" on one of the new "smartphones."

On our maiden voyage, I brought my Asus eeePC netbook to perform basic logging functions and to… well…write this column. I would still carry that pad and pen along in case the PC succumbs to Murphy's Law.

❖ Problems

As indicated above, no new amateur radio experience would be complete without a visit from Captain Edward A. Murphy. Remember that fancy computer controlled power management unit I mentioned early on in this article? In addition to providing excellent and intuitive power management for the camper, it had a "value added feature." It is a very efficient broad spectrum RF noise generator.

What to do about this nasty noise factory? The short term solution is to shut the unit down for the few hours I am playing radio and the XYL manages off of the trailer battery during that time -- a simple, but inelegant solution at best.

Once again the Internet comes to the rescue. It turns out that many A-liner camper folks gather in a "Yahoo Group" (http://groups.yahoo.com). It also turns out that more than a few of these folks are hams. A few rounds of conversations via this newsgroup and I learned what solutions others brought to the RF noise problem. A couple of judiciously placed capacitors and inductors brought the noise under tolerable levels, so it remains possible to play radio without breaking free from the AC power umbilical at the campsite.

The second problem was one of my own making (and a direct contradiction to things I have often shared in this very column). In my zeal to make a "shake down" run with both trailer and trailer based ham station, I forgot to pack a rudimentary set of electronics tools. I was lucky that I did not experience any equipment failures, but if something went bust, a VOM meter, a soldering iron and a couple of simple hand tools would go a long way in getting things back on the air.

I quickly put together a basic tool kit and added it to the "go bag" for the trailer camping setup. To that I would also add any relevant fuses, a couple of connector adapters for both power and feedline. I would still throw in that good old random length of wire, because, when conditions permit, it still makes one heck of a fine antenna for field use.

❖ Other Campsite Radio Fun

If your radio hobby fun is of a more general nature, by all means consider other ways to enjoy yourself. I often pack a small general coverage portable receiver. Sometimes it is fun to just sit back and do a little SWLing. I will often put the SW rig on during breakfast and "amaze" other nearby campers when they hear me listening to the news from something like Radio Australia. I am always looking to bring folks into the greatest hobby in the world!

So, no matter if you carry your station in your backpack, pull it in a trailer, or have a whole separate room full of radio gear in your bus sized RV, camping and ham radio go together like Bogart and Bacall, Lucy and Desi, Laurel and Hardy … you get the idea.

I am hoping that this new semi-retirement adventure will bring me many more opportunities to explore amateur radio in new and different ways. And when I come across something interesting, you can bet I'll be sharing it with you right here in the pages of *Monitoring Times*. I'll see you on the bottom end of 40 meters.

GETTING STARTED

THE BEGINNER'S CORNER

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Electronic Bargains and Pirate Radio Mania

Radio enthusiasts are notoriously cheap. Wait! Make that, "serious bargain hunters." And, with good reason: We spend thousands of dollars chasing electromagnetic spectrum DX and we're all looking for a little relief from sticker shock. This month I'm taking a look at three places you can go to trim costs.

❖ IBM Computers Cheap!

My first stop along the money-saving trail is your personal computer. I know that there are a fair number of *MT* readers who don't have a computer, mostly due to cost, as anyone who has priced new computers in the current economic environment knows. But, after spending big money on computers throughout the years, I finally found a solution that's right for me: refurbished, genuine IBM computers.

OK, all of you computer designers, Mac-enthusiasts, and software engineers reading this can skip this part. This is for all those *MT* readers who have balked at buying a computer or those who are tired of buying expensive computers that seem to crash regularly or need extensive trips to the repair shop.

Unlike radio purchases, computers are not items that become heirlooms. They are expendable tools that become beached on the banks of the increasingly fast-flowing river of electronic-age technology. So, get over it. Whatever computer you end up buying, unlike your trusty Kenwood TS-520, won't be much use a few years down the road. All you need in a computer is one that has a decent amount of processing speed and a fair amount of random access memory (RAM).

The computer I'm currently using for all my work and radio related activities is a refurbished IBM ThinkCentre with 1 Gigabyte of RAM and a Pentium 4 processor running at 3 GHz; speeds and memory sneered at by computer aficionados, but more than adequate for everything I do. But that's not all it has. This computer also came with a keyboard and mouse, DVD player, CD reader/writer, excellent sound card (for digital modes such as SSTV, RTTY, PSK31, etc.); two front-mounted USB ports that let me plug in my wireless Internet access air card, flash memory stick or digital camera. In addition, it came pre-loaded with Microsoft Windows XP® Professional Edition as well as a number of other useful programs. The price? Under $200.

But wait, there's more: The shipping was free and I got a seven day money-back guarantee, a three month warranty and an option to buy an extended warranty (not necessary, in my experience).

These computers are generally leased by IBM to businesses and are taken back when the company upgrades to a bigger or different system (or goes bust!). The computers are then refurbished by IBM technicians to latest technology and re-sold, but only online. That's a bit of a catch. How can you buy a computer online if you don't have a computer? You can call their 800 number and order direct (see resources). The online salespeople at IBM are extremely knowledgeable and will help you get just what you want. Since these are systems that come in irregularly, the supplies are limited. If they don't have one just like the one I've described, they'll have one very similar (their lowest priced desk top is $169) or you can check back in a few days or a week. The inventory changes daily.

Here's a word about reliability. These IBM desktops are exceedingly reliable. The first one I bought lasted for five years and never had a crash or any other malfunction. The only reason I got a newer, refurbished IBM desktop to replace it was because the old one didn't have enough RAM and processing speed to handle some of the very big programs that are routinely used today. So, for less than $200 for five years, it ended up being a good buy. I've had the current refurbished unit for well over a year and it too has performed flawlessly.

It's assumed that you already have a monitor, so these computers are sold without monitors. However, if you're just starting out, they also have refurbished monitors. Their 17" ThinkVision L171p sells for $89 and also comes with a three month warranty. This monitor has an LCD display with a resolution of 1280 x 1024 and analog and digital connectors.

IBM also has refurbished laptops and netbooks that are sold at considerable discounts, but they don't have the RAM or processing speeds that their desktops have at similar prices. Further, they don't enjoy the same reputation as their desktop models. Price for an IBM R60 ThinkPad is $285 and comes with a wireless modem, Windows XP Professional Edition, Gigabit Ethernet and WiFi modems built-in.

Two last things to know for those of you new to computers: IBM offers both desktop and laptop computers with either Microsoft Windows XP Pro or Vista operating systems. Avoid either laptop or desktop models with the Vista operating system; the XP Pro is a much better operating system. These refurbished computers come with basic instructions and are extremely easy to set up. Just follow the simple instructions and the machine pretty much does the rest. It's amazing.

❖ C. Crane's Big Savings

Long-time *MT* advertiser and mail-order electronics company, C. Crane, is a great source for interesting radios and accessories. They offer discounts on many items in the catalog that are customer returns that can be found on their web site, **www.ccrane.com**, by clicking on the "orphans" button. Discounts range from $10 to $50, depending on the expense of the item. These orphaned items carry the C. Crane 30 day guarantee.

Discount products available as this was written included radios of all types: WiFi Internet radios, portable multi-band radios, and HD-Radio receivers. I found the Sangean HDT-1 component tuner for $180 (regularly priced at $200). This is the same radio I have used for several years and found it the best performing of the HD-Radio sets I have reviewed. As with all similar discount sales, quantities are limited and inventory changes all the time. Make it a practice to check this website weekly for bargains you might be interested in.

Crane also has several pages of closeout items that are new but no longer to be carried at substantial discounts. When I checked the web site while writing this column I found the Kill-a-Watt EZ meter on sale for $40, marked

down from $60; Roberts Revival radio AM/FM radio, reviewed in the December issue of *MT*, for $150 marked down from $200; a refurbished C.Crane CCRadio AM/FM/Shortwave portable for sale at $120 marked down from $150. You can also call C.Crane at 800-552-8863 for more information.

❖ All Electronics Throwback Savings

Remember the good old days when really useful electronics catalogs used to come regularly to your actual mailbox? Well, one still does: All Electronics from Van Nuys, California has a 96 page catalog brimming with wonderful bits and pieces of electronics for the radio enthusiast and electronics builder in all of us. These are close-outs and surplus products at prices you won't find anywhere else. Check out a few of the items I came across recently:

A motorized AM/FM/CB antenna for your car that comes complete with splitter/feeds for your in-dash AM/FM radio and your under-dash CB set. Or, as they suggest, you can use the 12 volt powered unit as an actuator motor to move something lightweight (maybe an amateur radio satellite array?). It's $20.

Flat-panel, amplified UHF-TV antenna that can be mounted indoors or outside on a rotator for reception of UHF-TV channels. This antenna comes with 20 feet of weatherproofed coax, mounting hardware and wall adapter for $19. It's UHF only, so it won't work on VHF channels or FM. Reception of DTV signals varies widely from place to place; still, it might be just what you need.

All Electronics has electret microphones, perfect for making your own amateur radio mic for fifty cents apiece. I bought a handful of these years ago and use one for HF SSB and have always received unsolicited compliments on the audio. I haven't used the stock Kenwood mic in decades! I've also used these to make boom-mics for my 2 meter HT.

A 600 ohm pro-style, dynamic microphone, complete with 15 feet of XLR fitted cable, and 1/4"-to- micro adaptor is just $9.50. The cable alone is worth that much.

All Electronics has tons of wire for hobbyists: insulated, un-insulated, zip cord, coax, 34 conductor rainbow ribbon wire, RG-170 mini-coax (which I used on my homebrew microphone) priced at 10 feet for $2.50. How about 50 feet of stranded 24 gauge clear speaker wire for $2.25?

You can check out the latest bargains at **www.allelectronics.com** (you can also request a paper catalog to be sent to your home address online) or call them 800-826-5432.

❖ 2010 Pirate Radio Annual

In the July issue of *MT* I wrote an article about pirate radio in the U.S. (*Radio Pirates: The Intriguing World of Unlicensed Broadcasting*) and just as the issue was going to press I became aware of an excellent book that should be in your radio library. It's the *2010 Pirate Radio Annual* by Andrew Yoder, a veteran shortwave pirate monitor, and published by Hobby Publishing of Blue Ridge Summit, Pennsylvania.

The *2010 Pirate Radio Annual* is a 126 page perfect-bound, up-to-date resource for avid shortwave pirate monitors with abundant reproductions of actual pirate QSL cards, along with detailed information, including a brief history of each station and their activity over the past year, for over 150 pirate shortwave stations. You'll also find QSL routes with snail mail addresses for paper QSLs and email address for e-QSLs.

Never heard any of the shortwave pirates? Not to worry; the *2010 Pirate Radio Annual* comes with an audio CD of actual off-air recordings for 75 different stations. In the pirate radio spirit, the CD label warns: "Unauthorized rebroadcasting of this CD is encouraged."

The back cover of the book shows 13 full-color reproductions of recent pirate radio QSL cards including Radio Mushroom, Sycho Radio, Radio Ronin, Radio Lunchbox and everyone's favorite, Barnyard Radio. Price for the *Annual* is $15 plus $2 shipping from Cabinet Communications, P.O. Box 109, Blue Ridge Summit, Pennsylvania 17214.

RESOURCES:

www.allelectronics.com/ 888-826-5432
www.ccrane.com 1-800-522-8863
www.ibm.com/us/en/: click on "personal computers" under "products," then click on "desktops," "laptops," or "monitors." Or you may call 1-888-SHOP-IBM, opt 1 ext 8733 and speak directly with a sales representative.

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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The Brave New World of SW Listening

Sometimes being a shortwave listener reminds me of a joke I once read in a church bulletin. To paraphrase: How many (shortwave listeners) does it take to screw in a light bulb? The answer is ten: one to screw in the bulb and nine to talk about how much better the old bulb was!

I do often find myself reminiscing about "the good old days" of shortwave listening, when the bands were crowded and the propaganda flew at the speed of sound. The fact is the golden age of shortwave listening *is* in the past, but there are still excellent opportunities to listen to great programming, thanks to both older technology (shortwave) and newer technology, such as the Internet – especially when used together.

One of the advantages of listening in the twenty-first century, is the ability to listen to and even download programs on demand, when *you* want to listen to them. Stations all over the world offer this opportunity, and no matter what your interest there is something for you out there on the World Wide Web. The really nifty part is that you can set up almost all your topical listening with the help of a little software, so that once every few days, all the programs you like can be downloaded automatically, to be heard at your convenience in excellent quality.

Those stations that don't offer podcasts often stream programming live or on demand, too. As an example, I often listen to talk radio from Australia via domestic broadcasters 3AW in Melbourne and 6PR in Perth. Then there are those stations that are just heard best on shortwave, such as Radio Habana Cuba and WWCR (just your humble editor's opinion).

Podcasting and streaming also offer the opportunity to hear domestic programming from other nations on a regular basis. The CBC in Canada podcasts extensively, as do the BBC, the ABC in Australia, Radio New Zealand, and RTE in Ireland. Voice of Russia has started offering some of its programs on its website for on demand listening. Most recently, Deutsche Welle has dramatically increased its podcast output, while Radio Swedent seems to be the newest radio station about to go web only.

❖ Where to get them

Most radio stations have a "podcasting page" associated with their website. Often you can download the programs from these pages, or set up a "podcatching" program such as iTunes to automatically download the latest programs when you log in.

BBC -

Go to **http://www.bbc.co.uk/podcasts/** to enter the vast world of BBC Radio podcasts. They offer dozens if not hundreds of different programs. Favorites include **Friday Night Comedy from BBC 4** and **Newshour** from the World Service.

CBC -

Go to **www.cbc.ca/podcasting/** for programming from the Canadian Broadcasting Corporation and Radio Canada International. **White Coat, Black Art** (about the health system) and **As It Happens** are highly recommended. Sadly, the one program that would be a must hear podcast, **The Art of Persuasion**, is not available as a podcast due to rights issues.

ABC -

w**ww.abc.net.au/services/podcasting/** is your gateway to the podcasts of the Australian Broadcasting Corporation. You can find podcasts of both the domestic ABC and Radio Australia. Highlights include **Asia-Pacific** and **Correspondents Notebook** from Radio Australia, and **The Science Show** from ABC (the Australian version of CBC's Quirks and Quarks).

Radio New Zealand -

w**ww.radionz.co.nz/podcasts Sounds Historical**, **At the Movies** and **Media Watch** are just some of the terrific podcasts available from RNZ. Of course once again the program that should be a podcast, **Matinee Idle**, isn't available, as always due to copyright issues.

RTE, Ireland -

http://www.rte.ie/radio/podcast/ There are a number of gems available from Ireland. Some favorites include **Seascapes**, the maritime program, **Documentary on 1**, and **Why?** Which is an intriguing new program answering questions from boys and girls all over the country.

Deutsche Welle

DW has really embraced the World Wide Web. Already well established with its web presence, through social bookmaking, RSS feeds, widgets and Facebook, DW was noted offering almost all of their programming by way of podcasts.

Want to learn German? All of their **German by Radio** programs are now available as podcasts. Download classical music podcasts, News and information, **In Box** and a number of sports podcasts. There are some really exciting listening opportunities now, via DW podcasts.

There are thousands of downloadable programs and we haven't even touched on non-English and video podcasts, which also abound.

❖ Twirling the dials

While podcasts are great, that doesn't mean that shortwave doesn't still turn up some gems. While it's handy to have lists of times and frequencies, there is still a joy to just tuning up and down the dial until something catches one's fancy.

The other night, while downloading the latest batch of podcasts, tuning up and down the 41 mB brought a pretty good signal from **Radio Romania International (RRI)**. It's a far cry from the Ceaucescu era 1980s propaganda machine it once was. In some ways it has gone too far the other way, occasionally even rehabilitating Romanians who collaborated with the country's wartime German allies. On this particular night, RRI was starting to wind down its English broadcast on 7385 kHz, before switching to French.

Interestingly, RRI uses the same bumper music to introduce its newscast as Kol Israel does, more than once momentarily tricking me into confusing the two stations.

Pro Memoria, a Romanian history program is usually heard Mondays. **Travellers' Guide** is another exceptional, occasional program heard on UTC Thursdays. Try at Midnight UTC on 7385 kHz. Also try 9580 kHz at that time.

❖ What's New?

Voice of Russia programs added

There are a few new items on the Voice of Russia line-up. These include **Red Line** and **Let's Discuss It**.

Red Line is produced every weekend and is hosted by Sergei Strokan and Mira Salganik. Together they "draw the line under the most significant events of the week." One might suggest that they do this with a Strokan of Sergei's pen, but that would be a pun even Joe Adamov would roll his eyes at. It sounds like a fairly interesting effort on the part of the **Voice of Russia**. The program will feature "leading experts, and political and cultural figures sharing or opposing our views." A lively debate program on the **Voice of Russia** would certainly be welcome.

The first three episodes of the program looked at the new START treaty between Russia and the United States and whether it was heralding a new era in Russo-American relations, Obama's new national security strategy, and a fascinating discussion of Ukraine's new President Yanikovich. Sergei and Mira had diametrically opposing opinions on what his election meant and even whether Yanikovich was indeed Moscow's puppet. Mark a "**red line**" on your listening schedule for this one.

The "broadcast schedule" on the **Voice of Russia** website does not list this program (it's also out of date as of this writing), assuming it's not just a web based feature. However if you navigate to the **Red Line** page on the Voice of Russia website, you can listen to or download

individual programs, possibly all of them but certainly the most recent.

Let's Discuss It seems to be just a website feature, in which listeners give their opinions on events around the world as far ranging as the Victory in the Great Patriotic War (World War II) and the (literal) fallout from the Icelandic volcano, whose name sends shivers through spell checkers everywhere. If this is not part of a Voice of Russia program it should be. It would be a fine compliment to **Moscow Mailbag**.

While on the topic of **The Voice of Russia**, this summer there has been an extra frequency for **Voice of Russia** programming, 7440 kHz from 0000-0200 UTC. This is in addition to 9890 kHz, which starts at 2200 UTC. Reception here in Canada has been noted as fair to good. Recently I've been trying 7440 and then switching to the internet stream around 0200 UTC. When the internet stream is active, there is a link on the page in the upper right corner of the website. This harkens back to the early eighties when the radio could be left on a **Radio Moscow** frequency all evening without retuning.

Radio Sweden leaving shortwave

Radio Sweden has announced that it will leave shortwave effective October 31, 2010. It has cancelled a few services, mainly in the Balkan languages (Albanian, Bosnian-Croatian-Serbian) and Aramaic. The rest of its output will be restricted to the internet and FM radio for the most part. German and Russian programming will be web-only.

According to a statement by Swedish Radio's Program Director Björn Löfdahl, "We have to be where the audience is, and today our audience in the rest of the world is on the Web. It doesn't feel relevant to broadcast on short or medium wave, and it isn't economically defendable or journalistically justified. Now the money can be directed to where it is needed." (One can argue whether shortwave is "journalistically justified"; after all, it's easier to block a website than a radio signal, but it's hard to argue the economics of the decision.)

So we have just a few months to listen to **Swedish Radio International** via shortwave. As of November all of the Nordic countries will have abandoned the shortwave bands. Whoddathunkit 20 years ago?! There will be a certain nostalgic longing for the days when **Radio Sweden's** hauntingly beautiful, multilingual interval signal/station ID could be heard every night (as a student of Russian in the late '70s and early '80s, I especially liked the Russian ID… "Radio Schvetsia, Shtock-golm") but then again, I've already been downloading the podcasts for months. As someone much more famous said, "the times they are a-changin."

New Programs Coming to VoA

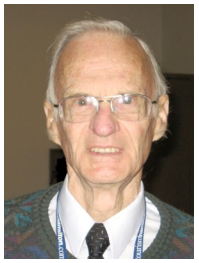
According to a **VoA** press release posted to the ODXA yahoo group by Alokesh Gupta, **VoA** is to introduce a number of new programs to its English language output. As Richard Cuff pointed out, none of the programs have yet appeared on the **VoA** website, as this is written. Still they should be worth checking out, when they do debut, perhaps by the time you read this.

"Three new radio programs, **Daybreak Asia**, **Crossroads Asia**, and **Middle East Monitor**, focus on key developments in each region, with in-depth features, more newsmaker interviews and dynamic interaction with listeners, viewers and website visitors. Another program, **International Edition**, provides lively, fast-paced world news coverage, and American Café brings you stories about life in the United States."

❖ NASB 2010, Hamilton, Ontario, Canada

In late May, the National Association of Shortwave Broadcasters held their annual meeting in Southern Ontario at Mohawk College in Hamilton. Since it's quite rare that something like this happens in my back yard, I decided I'd kick myself later if I didn't go. I attended Day 2 of the conference and it was well worth the time and effort to get there.

Highlights of the day included a talk by my friend and ODXA colleague Steve Canney on his experiences in the hobby and his activities as QSL manager for CFRB/CFRX in Toronto, some slide presentations on the history and activities of WEWN in Birmingham, AL, and the rather dramatic flood waters at the WWCR transmitter site in Nashville, TN. In retrospect, the flooding in Tennessee was rather under-reported here in Canada.



For anyone who has ever collected QSLs, it was a treat to hear and see the presentation by Dr. Adrian Peterson of Adventist World Radio's *Wavescan*. He brought his Canadian QSLs and what an impressive collection it is, going back to the 1930s. Some of his postcards go back to the Marconi experiments.

Another treat was learning more about Galcom, the organization that played host to the conference. My seatmate was a young man who turned out to be the Executive Director of Galcom, Tim Whitehead. It was interesting to hear about the activities of Galcom, an organization that manufactures and helps distribute pre-tuned missionary radios and even complete radio stations comparable in size to a personal computer!

Perhaps the best part of the day was just the opportunity to chat with folks from both sides of the microphone. It was fun to meet and chat with ODXer Michael Murray, Hans Johnson, Dr Jerry Plummer of WWCR, Tim Whitehead and Rev Allan McGuirl of Galcom, and Glen Tapley of WEWN.

It was also really nice to meet Jeff White, who I have corresponded with and listened to, for

over 25 years via various radio stations, and his lovely wife Thais. If you have heard Jeff White on the radio, that is exactly how he is in person. And it was also a delight to meet Adrian Peterson and his charming wife. If you ever get a chance to attend one of these meetings, by all means do so. And after the business meeting announced the site of the next meeting – on board a cruise ship – I clearly attended one year too soon!

❖ We get letters…

It's nice to get an actual hand written letter, an increasingly rare thing in this internet age, and I appreciate the time it took to write. Ronnie Smith from Hot Springs, AR corrects a mistake I made in the February issue. Ronnie points out that I listed The Golden Age of Radio on WWCR at 2300 UTC on 3240 kHz, whereas Ronnie heard them on 7465 kHz, Saturdays. Ronnie also mentions being an RTE listener when that station used to broadcast on 13640 kHz from 1830-1900 UTC. Thanks, Ronnie!

How to Use the Shortwave Guide

0000-0100 twhfa USA, Voice of America 5995am 6130ca 7405am 9455af

① ② ⑤ ③ ④ ⑥ ⑦

Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Standard Time) 5, 6, 7 or 8 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all *dates*, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 7:30 pm Eastern, 6:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. English broadcasts are listed by UTC time on ① , then alphabetically by country ③, followed by the station name ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not *daily*, the days of broadcast ⑤ will appear in the column following the time of broadcast, using the following codes:

Codes	
s/Sun	Sunday
m/Mon	Monday
t	Tuesday
w	Wednesday
h	Thursday
f	Friday
a/Sat	Saturday
occ:	occasional
DRM:	Digital Radio Mondiale
irreg	Irregular broadcasts
vl	Various languages
USB:	Upper Sideband

Choose the most promising frequencies for the time, location and conditions.

The frequencies ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions. But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and *MT* readers to make the Shortwave Guide up-to-date as of one week before print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the target area ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas
- af: Africa
- al: alternate frequency (occasional use only)
- am: The Americas
- as: Asia
- ca: Central America
- do: domestic broadcast
- eu: Europe
- me: Middle East
- na: North America
- pa: Pacific
- sa: South America
- va: various

Mode used by all stations in this guide is AM unless otherwise indicated.

MT MONITORING TEAM

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Additional Contributors to This Month's Shortwave Guide:

Thank You to …

BCL News; DX Asia; British DX Club; Cumbre DX; DSWCI-DX Window, Hard-Core DX; Radio Bulgaria DX Mix News; Media Broadcast, Play DX; WWDXC-BC DX-Top News; World DX Club/Contact, PTSW; World Radio TV Handbook.

Alokesh Gupta, New Delhi, India; Elena Osipova, VO Russia; Ivo Ivanov; Bulgaria; Sean Gilbert, UK; Bob Fraser, Belfast, ME; Rachel Baughn/MT; Ron Howard, CA; Hans Johnson; Rich D' Angelo/NASWA-Flash Sheet, NASWA-Journal; Tom Taylor, UK.

Shortwave Broadcast Bands

kHz	Meters
2300-2495	120 meters (Note 1)
3200-3400	90 meters (Note 1)
3900-3950	75 meters (Regional band, used for broadcasting in Asia only)
3950-4000	75 meters (Regional band, used for broadcasting in Asia and Europe)
4750-4995	60 meters (Note 1)
5005-5060	60 meters (Note 1)
5730-5900	49 meter NIB (Note 2)
5900-5950	49 meter WARC-92 band (Note 3)
5950-6200	49 meters
6200-6295	49 meter NIB (Note 2)
6890-6990	41 meter NIB (Note 2)
7100-7300	41 meters (Regional band, not allocated for broadcasting in the western hemisphere) (Note 4)
7300-7350	41 meter WARC-92 band (Note 3)
7350-7600	41 meter NIB (Note 2)
9250-9400	31 meter NIB (Note 2)
9400-9500	31 meter WARC-92 band (Note 3)
9500-9900	31 meters
11500-11600	25 meter NIB (Note 2)
11600-11650	25 meter WARC-92 band (Note 3)
11650-12050	25 meters
12050-12100	25 meter WARC-92 band (Note 3)
12100-12600	25 meter NIB (Note 2)
13570-13600	22 meter WARC-92 band (Note 3)
13600-13800	22 meters
13800-13870	22 meter WARC-92 band (Note 3)
15030-15100	19 meter NIB (Note 2)
15100-15600	19 meters
15600-15800	19 meter WARC-92 band (Note 3)
17480-17550	17 meter WARC-92 band (Note 3)
17550-17900	17 meters
18900-19020	15 meter WARC-92 band (Note 3)
21450-21850	13 meters
25670-26100	11 meters

Notes

Note 1 Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.

Note 2 Broadcasters can use this frequency range on a (NIB) non-interference basis only.

Note 3 WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007

Note 4 WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

0000	0004		Canada, Radio Canada International			6100na
0000	0015	mtwhf	Moldova, (Transnistria) Radio PMR			9665na
0000	0027		Czech Republic, Radio Prague			9790na
0000	0030		Egypt, Radio Cairo	11590na		
0000	0030	vl	Guyana, Voice of Guyana	3290va		
0000	0030		Thailand, Radio Thailand World Service			15275na
0000	0030		USA, Voice of America	7555as		
0000	0045		India, All India Radio	6055as		7305as
			9705as	11645as	13605as	
0000	0056		Romania, Radio Romania International			7385na
			9580na			
0000	0057		Canada, Radio Canada International			11700as
0000	0100		Anguilla, Worldwide Univ Network			6090am
0000	0100		Australia, ABC NT Alice Springs			4835do
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek			4910do
0000	0100		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	17750as
			17715pa	17795pa		
0000	0100		Bahrain, Radio Bahrain	6010me		
0000	0100		Canada, CFRX Toronto ON	6070na		
0000	0100		Canada, CFVP Calgary AB	6030na		
0000	0100		Canada, CKZN St John's NF	6160na		
0000	0100		Canada, CKZU Vancouver BC	6160na		
0000	0100		China, China Radio International			6020eu
			6075as	6180as	7350eu	7415as
			9570eu	11790as	11885as	13750as
0000	0100		Germany, Deutsche Welle	9885as		15595as
			17525as			
0000	0100		Malaysia, RTM/Traxx FM	7295do		
0000	0100		New Zealand, Radio NZ International			15730pa
0000	0100	DRM	New Zealand, Radio NZ International			15720pa
0000	0100		Russia, Voice of Russia	7440na		9890na
0000	0100		Spain, Radio Exterior de Espana			6055na
0000	0100		Sri Lanka, SLBC	6005as	9770as	15745as
0000	0100		UK, BBC World Service	5970as		6195as
			7395as	9740as	12095as	13725as
0000	0100		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0000	0100		USA, EWTN/WEWN Vandiver AL			11520af
0000	0100		USA, WBCQ Monticello ME	5110usb		9330am
			7415usb			
0000	0100		USA, WHRI Cypress Creek SC			5875na
			5920am	7315na		
0000	0100	vl	USA, WINB Red Lion PA	9265ca		
0000	0100		USA, WRMI Miami FL	9955ca		
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WTWW Lebanon TN	9480na		
0000	0100		USA, WWCR Nashville TN	4840na		7465na
			9980na			
0000	0100		USA, WWRB Manchester TN	3185na		3215na
			5050na			
0000	0100		USA, WYFR/Family Radio Worldwide			5950na
			6985na	7360sa	7520sa	9505na
			15440na			
0000	0100		Zambia, 1 Africa Radio/CVC	4965af		
0005	0100	twhfa	Canada, Radio Canada International			6100na
0030	0045	twhfas	Albania, Radio Tirana	9860na		
0030	0100		China, China Radio International			11730as
0030	0100		Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			
0030	0100	mtwhfa	Serbia, International Radio of Serbia			9675na
0030	0100		Thailand, Radio Thailand World Service			15275na
0030	0100	Sun	UK, Bible Voice Broadcasting	7405as		
0030	0100		USA, Voice of America/Special English			7430as
			9715as	9780va	11725va	15205va
			15290va	15560va	17820va	
0040	0100	mtwhf	Moldova, (Transnistria) Radio PMR			9665eu

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

0100	0104	twhfa	Canada, Radio Canada International			6100na
0100	0127		Czech Republic, Radio Prague			7345na
0100	0130		China, China Radio International			11730as
0100	0130		Slovakia, Radio Slovakia International			5930na
			9440sa			
0100	0130		Vietnam, Voice of Vietnam	6175na		
0100	0157		North Korea, Voice of Korea	9345as		9730as
			11735sa	13760as	15180as	
0100	0159		Canada, Radio Canada International			9620as
0100	0200		Anguilla, Worldwide Univ Network			6090am
0100	0200		Australia, ABC NT Alice Springs			4835do
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek			4910do
0100	0200		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	17750as
			17715pa	17795pa		
0100	0200		Bahrain, Radio Bahrain	6010me		
0100	0200		Canada, CFRX Toronto ON	6070na		
0100	0200		Canada, CFVP Calgary AB	6030na		
0100	0200		Canada, CKZN St John's NF	6160na		
0100	0200		Canada, CKZU Vancouver BC	6160na		
0100	0200		China, China Radio International			6020eu
			6080na	6175eu	9410eu	9470eu
			9535as	9570eu	9580na	9790na
			11870as	15785as		
0100	0200		Cuba, Radio Havana Cuba	5970na		6000na
			6060na			
0100	0200	vl	Guyana, Voice of Guyana	3290va		
0100	0200		Malaysia, RTM/Traxx FM	7295do		
0100	0200		New Zealand, Radio NZ International			13730pa
0100	0200	DRM	New Zealand, Radio NZ International			15720pa
0100	0200		Russia, Voice of Russia	7440na		9890na
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, Radio Taiwan International			11875as
0100	0200		UK, BBC World Service	5970as		6195as
			7395as	9410as	9740as	11750as
			12095as	13725as	15310as	15335as
			15360as	17615as		
0100	0200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0100	0200		USA, EWTN/WEWN Vandiver AL			11520af
0100	0200		USA, KJES Vado NM	7555na		
0100	0200		USA, KJES Vado, NM	7555na		
0100	0200		USA, Voice of America	7430va		9780va
			11705va			
0100	0200		USA, WBCQ Monticello ME	5110usb		9330am
			7415usb			
0100	0200		USA, WHRI Cypress Creek SC			5875na
			5920am	7315na		
0100	0200	vl	USA, WINB Red Lion PA	9265ca		
0100	0200		USA, WRMI Miami FL	9955ca		
0100	0200		USA, WRNO New Orleans LA	7505am		
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WTWW Lebanon TN	5080na		
0100	0200		USA, WWCR Nashville TN	3215na		4840na
			9980na			
0100	0200		USA, WWRB Manchester TN	3185na		5050na
			5745na			
0100	0200		USA, WYFR/Family Radio Worldwide			6985na
			9505na	15440na		
0100	0200		Zambia, 1 Africa Radio/CVC	4965af		
0130	0200		Iran, VOIRI/IRIB	7245na	9495na	
0130	0200		Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			
0130	0200		Sweden, Radio Sweden	6010na		
0130	0200	twhfa	USA, Voice of America/Special English			7465ca
			9820ca			
0130	0200		USA, WHRI Cypress Creek SC			5920am
			15710am			
0140	0200		Vatican City State, Vatican Radio			7335va
			11850as			
0145	0200	twhfas	Albania, Radio Tirana	7425na		

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

0200	0215		Croatia, Croatian Radio		3985eu	9925am
0200	0227		Iran, VOIRI/IRIB	7245na	9495na	
0200	0230		Thailand, Radio Thailand World Service			15275na
0200	0230		USA, KJES Vado NM	7555na		
0200	0230		USA, KJES Vado, NM	7555na		
0200	0230	Sun	USA, WHRI Cypress Creek SC			5875na
0200	0245		USA, WYFR/Family Radio Worldwide			11835na
0200	0257		North Korea, Voice of Korea	13650as		15100as
0200	0300		Anguilla, Worldwide Univ Network			6090am
0200	0300	twhfa	Argentina, Radio Nacional RAE			11710am
0200	0300		Australia, ABC NT Alice Springs			4835do
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek			4910do
0200	0300		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0200	0300		Bahrain, Radio Bahrain	6010me		
0200	0300		Bulgaria, Radio Bulgaria	9700na		11700na
0200	0300		Canada, CFRX Toronto ON	6070na		
0200	0300		Canada, CFVP Calgary AB	6030na		
0200	0300		Canada, CKZN St John's NF	6160na		
0200	0300		Canada, CKZU Vancouver BC	6160na		

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0200	0300		China, China Radio International			11770as
			13640as			
0200	0300		Cuba, Radio Havana Cuba	5970na		6000na
			6060na			
0200	0300		Egypt, Radio Cairo	6270na		
0200	0300	vl	Guyana, Voice of Guyana	3290va		
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		New Zealand, Radio NZ International			13730pa
0200	0300	DRM	New Zealand, Radio NZ International			15720pa
0200	0300		Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			
0200	0300		Philippines, PBS/ Radyo Pilipinas			11880me
			15510me	15285me		
0200	0300		Russia, Voice of Russia	9665sa		15425na
0200	0300		South Korea, KBS World Radio			9580sa
0200	0300		Taiwan, Radio Taiwan International			5950na
			9680ca			
0200	0300		Uganda, Radio Uganda	4975do		
0200	0300		UK, BBC World Service	6005af		6195as
			9410as	12095as	15310as	
0200	0300		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0200	0300		USA, EWTN/WEWN Vandiver AL			11520af
0200	0300		USA, WBCQ Monticello ME	5110usb		9330am
			7415usb			
0200	0300		USA, WHRI Cypress Creek SC			7315am
			15710am			
0200	0300	vl	USA, WINB Red Lion PA	9265ca		
0200	0300		USA, WRMI Miami FL	9955ca		
0200	0300		USA, WRNO New Orleans LA	7505am		
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WTWW Lebanon TN	9480na		
0200	0300		USA, WWCR Nashville TN	3215na		4840na
			5890na			
0200	0300		USA, WWRB Manchester TN	3185na		5050na
			5745na			
0200	0300		USA, WYFR/Family Radio Worldwide			5985ca
			6100sa	6985na	9385ca	9505na
0200	0300		Zambia, 1 Africa Radio/CVC	4965af		
0215	0230		Nepal, Radio Nepal	5005as		
0230	0300	twhfas	Albania, Radio Tirana	7425na		
0230	0300		Sweden, Radio Sweden	6010na		9510va
0230	0300		Vietnam, Voice of Vietnam	6175na		
0245	0300		Australia, HCJB Global Voice Australia			15400as
0245	0300		India, All India Radio	3945do		
0250	0300		Vatican City State, Vatican Radio			6040am
			7305am	9610am		

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

0300	0315	Sun	Swaziland, TWR Africa	3200af		
0300	0320		Vatican City State, Vatican Radio			6040am
			7305am	9610am		
0300	0327		Czech Republic, Radio Prague			7345na
0300	0330		Egypt, Radio Cairo	6270na		
0300	0330		Philippines, PBS/ Radyo Pilipinas			11880me
			15510me	15285me		
0300	0330		Sri Lanka, SLBC	6005as	9770as	15745as
0300	0330		Vatican City State, Vatican Radio			7360af
			9660af	15460as		
0300	0355		South Africa, Channel Africa	6135af		
0300	0356		Romania, Radio Romania International			7335na
			9645na	11895as	15340as	
0300	0357		North Korea, Voice of Korea	7200as		9345as
			9730as			
0300	0400		Anguilla, Worldwide Univ Network			6090am
0300	0400		Australia, ABC NT Alice Springs			4835do
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek			4910do
0300	0400		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0300	0400		Bahrain, Radio Bahrain	6010me		
0300	0400	twhfas	Canada, CBC NQ SW Service	9625na		
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St John's NF	6160na		
0300	0400		Canada, CKZU Vancouver BC	6160na		
0300	0400		China, China Radio International			9690na
			9790na	11770as	15110as	15120eu
			15785as			
0300	0400		Cuba, Radio Havana Cuba	5970na		6000na
			6060na			
0300	0400		Germany, Deutsche Welle	12005as		15595as
0300	0400	vl	Guyana, Voice of Guyana	3290va		
0300	0400		Malaysia, RTM/Traxx FM	7295do		
0300	0400		New Zealand, Radio NZ International			13730pa
0300	0400	DRM	New Zealand, Radio NZ International			15720pa
0300	0400		Oman, Radio Oman	15355af		
0300	0400		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
0300	0400		Russia, Voice of Russia	9665sa		15425na
			15585as			
0300	0400	DRM	Russia, Voice of Russia	15735as		
0300	0400		South Africa, Channel Africa	3345af		
0300	0400		Taiwan, Radio Taiwan International			5950na
			15320as			
0300	0400		Turkey, Voice of Turkey	5975va		6165va
0300	0400		Uganda, Radio Uganda	4975do		
0300	0400		UK, BBC World Service	3255af		6005af
			6145af	6190af	6195va	7255af
			9750af	11945af	12035as	12095as
			15310as	17790as		
0300	0400		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0300	0400		USA, EWTN/WEWN Vandiver AL			9455af
0300	0400		USA, Voice of America	4930af		6080af
			9855af	15580af		
0300	0400		USA, WBCQ Monticello ME	5110usb		9330am
			7415usb			
0300	0400		USA, WHRI Cypress Creek SC			5875na
			7315am	15700na		
0300	0400	vl	USA, WINB Red Lion PA	9265ca		
0300	0400		USA, WRMI Miami FL	9955ca		
0300	0400		USA, WRNO New Orleans LA	7505am		
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WTWW Lebanon TN	9480na		
0300	0400		USA, WWCR Nashville TN	3215na		4840na
			5890na			
0300	0400		USA, WWRB Manchester TN	3185na		5050na
			5745na			
0300	0400		USA, WYFR/Family Radio Worldwide			6985na
			9505na	11740sa	15255sa	
0300	0400		Zambia, 1 Africa Radio/CVC	4965af		
0330	0357		Czech Republic, Radio Prague			9445me
0330	0400	twhfas	Albania, Radio Tirana	7425na		
0330	0400	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0330	0400		UK, BBC World Service	11945af		
0330	0400	m	USA, WHRI Cypress Creek SC			5920am
0330	0400		Vietnam, Voice of Vietnam	6175na		
0345	0400	vl/Sat/Sun	Uganda, Radio Uganda	4975do		

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

0400	0430	mtwhf	France, Radio France Internationale			9805af
			11995af			
0400	0430	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0400	0430		USA, Voice of America	4930af		6080af
			9855af	12080af	15580af	
0400	0445		USA, WYFR/Family Radio Worldwide			6985na
			9505na			
0400	0458		New Zealand, Radio NZ International			13730pa
0400	0458	DRM	New Zealand, Radio NZ International			15720pa
0400	0500		Anguilla, Worldwide Univ Network			6090am
0400	0500		Australia, ABC NT Alice Springs			4835do
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek			4910do
0400	0500		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0400	0500		Bahrain, Radio Bahrain	6010me		
0400	0500	twhfas	Canada, CBC NQ SW Service	9625na		
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St John's NF	6160na		
0400	0500		Canada, CKZU Vancouver BC	6160na		
0400	0500		China, China Radio International			6020na
			6080na	13750as	15120eu	15785as
			17730af	17855af		
0400	0500		Cuba, Radio Havana Cuba	5970na		6000na
			6060na			
0400	0500		Germany, Deutsche Welle	6180af		7240af
			12045af	15400af		
0400	0500	vl	Guyana, Voice of Guyana	3290va		
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Russia, Voice of Russia	13775na		
0400	0500		South Africa, Channel Africa	3345af		
0400	0500		Sri Lanka, SLBC	6005as	9770as	15745as
0400	0500		Uganda, Radio Uganda	4975do		
0400	0500		UK, BBC World Service	3255af		6055af
			6190af	7255af	7310af	9410eu
			12035af	12095as	13675eu	15310as
			15360as	17790as		

0400	0500		USA, American Forces Network				4319usb
			5446usb	5765usb	7812usb	12133usb	
			12759usb	13362usb			
0400	0500		USA, EWTN/WEWN Vandiver AL				9455af
0400	0500		USA, WBCQ Monticello ME		5110usb		7415usb
0400	0500		USA, WHRI Cypress Creek SC				7315am
0400	0500	smtwhf	USA, WHRI Cypress Creek SC				7365eu
0400	0500	Sat	USA, WHRI Cypress Creek SC				9825me
0400	0500		USA, WRMI Miami FL		9955ca		
0400	0500		USA, WRNO New Orleans LA		7505am		
0400	0500		USA, WTJC Newport NC		9370na		
0400	0500		USA, WTWW Lebanon TN		9480na		
0400	0500		USA, WWCR Nashville TN		3215na	4840na	
			5890na				
0400	0500		USA, WWRB Manchester TN		3185na		
0400	0500		USA, WYFR/Family Radio Worldwide				9680na
0400	0500		Zambia, 1 Africa Radio/CVC		4965af		9430af
			5925al				
0430	0500	Sat/Sun	Greece, Voice of Greece		11645eu		
0430	0500		Palau, T8WH/WHRI/Sound of Hope Radio				
			15700as				
0430	0500	mtwhf	Swaziland, TWR Africa		3200af		4775af
0430	0500		USA, Voice of America		4930af		4960af
			6080af	12080af	15580af		
0430	0500		USA, WHRI Cypress Creek SC				15700am
0430	0500	mtwhf	USA, WHRI Cypress Creek SC				5920am
0455	0500		Nigeria, Voice of Nigeria/External Service				
			15120eu				
0459	0500		New Zealand, Radio NZ International				11725pa
0459	0500	DRM	New Zealand, Radio NZ International				11675pa

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

0500	0507	twhfas	Canada, CBC NQ SW Service		9625na		
0500	0530		China, CNR-11/Holy Tibet		9530do		11685do
			15570do				
0500	0530		Czech Republic, Radio Prague				9955ca
0500	0530	mtwhf	France, Radio France Internationale				11995af
			13680af				
0500	0530		Germany, Deutsche Welle		6180af		7430af
			9700af	9825af			
0500	0530		Japan, NHK World/ Radio Japan				5975va
			6110na	11970as	15205as		17810as
0500	0530	Sun	UK, BBC World Service		15420af		
0500	0530		Vatican City State, Vatican Radio				4005eu
			5965eu	7250eu	9660af		11625af
			13765af				
0500	0555		Sri Lanka, SLBC	6005as	9770as		15745as
0500	0600		Anguilla, Worldwide Univ Network				6090am
0500	0600		Australia, ABC NT Alice Springs				4835do
0500	0600		Australia, ABC NT Katherine		5025do		
0500	0600		Australia, ABC NT Tennant Creek				4910do
0500	0600		Australia, Radio Australia		9660pa		12080pa
			13630as	15160pa	15230pa		15415as
			17750as				
0500	0600		Bahrain, Radio Bahrain		6010me		
0500	0600		Bhutan, Bhutan Broadcasting Service				6035as
0500	0600		Canada, CFRX Toronto ON		6070na		
0500	0600		Canada, CKZN St John's NF		6160na		
0500	0600		Canada, CKZU Vancouver BC		6160na		
0500	0600		China, China Radio International				6020na
			6190na	11710me	11895as		15350as
			15465as	17505af	17540as		17730af
			17855af				
0500	0600		Cuba, Radio Havana Cuba		5970na		6010na
			6010na	6060na			
0500	0600	DRM	Germany, Deutsche Welle		17525as		
0500	0600	mtwhf	Greece, Voice of Greece		11645eu		
0500	0600	vl	Guyana, Voice of Guyana		3290va		
0500	0600		Kuwait, Radio Kuwait		15110as		
0500	0600		Liberia, Star Radio		4025af		
0500	0600		Malaysia, RTM/Traxx FM		7295do		
0500	0600		New Zealand, Radio NZ International				11725pa
0500	0600	DRM	New Zealand, Radio NZ International				11675pa
0500	0600		Nigeria, Voice of Nigeria/External Service				
			15120eu				
0500	0600		Russia, Voice of Russia		13775na		
0500	0600	mtwh	Slovakia, IRRS/Euro Gospel Radio				5990va
0500	0600		South Africa, Channel Africa		7230af		
0500	0600		Swaziland, TWR Africa		3200af		6120af
			9500af				
0500	0600		Taiwan, Radio Taiwan International				5950na
0500	0600		Uganda, Radio Uganda		4975do		
0500	0600		UK, BBC World Service		3995eu		7255af
			7310af	9410eu	11945af		12095va
			15310as	15360as	15560eu		17640af
			17790as				
0500	0600	mtwhf	UK, BBC World Service		15420af		
0500	0600		USA, American Forces Network				4319usb
			5446usb	5765usb	7812usb	12133usb	
			12759usb	13362usb			
0500	0600		USA, EWTN/WEWN Vandiver AL				6890va
0500	0600		USA, Voice of America		4930af		6080af
			12080af	15580af			
0500	0600		USA, WBCQ Monticello ME		5110usb		7415usb
0500	0600		USA, WHRI Cypress Creek SC				5920am
			7365va	11565pa			
0500	0600		USA, WRMI Miami FL		9955ca		
0500	0600		USA, WTJC Newport NC		9370na		
0500	0600		USA, WTWW Lebanon TN		9480na		
0500	0600		USA, WWCR Nashville TN		3215na	4840na	
0500	0600		USA, WWRB Manchester TN		3185na		
0500	0600		USA, WYFR/Family Radio Worldwide				9680na
0500	0600		Zambia, 1 Africa Radio/CVC		4965af		
0515	0530		Rwanda, Radio Rwanda		6055do		
0530	0556		Romania, Radio Romania International				9655eu
			21500pa	17760pa			
0530	0556	DRM	Romania, Radio Romania International				7305eu
0530	0600		Clandestine, Sudan Radio Service/ SRS				13720af
0530	0600		Palau, T8WH/WHRI/Sound of Hope Radio				
			15700as				
0530	0600		Thailand, Radio Thailand World Service				17655eu
0530	0600		USA, WHRI Cypress Creek SC				15700am

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

0600	0615	Sat/Sun	South Africa, TWR Africa		11640af		
0600	0630	Sat/Sun	Australia, Radio Australia		15290as		
0600	0630		China, Xizang PBS/Holy Tibet		4905do		4920do
			5240do	6110do	6130do		6200do
			9490do	9580do			
0600	0630	mtwhf	France, Radio France Internationale				9765af
			11615af	15160af	17800af		
0600	0630		Germany, Deutsche Welle		7325af		15275af
0600	0630	Sat/Sun	Greece, Voice of Greece/Radio Filia				11645eu
0600	0630		Laos, Lao National Radio		7145as		
0600	0645	mtwhf	South Africa, TWR Africa		11640af		
0600	0658		New Zealand, Radio NZ International				11725pa
0600	0658	DRM	New Zealand, Radio NZ International				11675pa
0600	0700		Anguilla, Worldwide Univ Network				6090am
0600	0700		Australia, ABC NT Alice Springs				4835do
0600	0700		Australia, ABC NT Katherine		5025do		
0600	0700		Australia, ABC NT Tennant Creek				4910do
0600	0700		Australia, Radio Australia		9660pa		12080pa
			13630as	13690pa	15160pa		15230pa
			17750as				
0600	0700		Bahrain, Radio Bahrain		6010me		
0600	0700		Canada, CFRX Toronto ON		6070na		
0600	0700		Canada, CFVP Calgary AB		6030na		
0600	0700		Canada, CKZN St John's NF		6160na		
0600	0700		Canada, CKZU Vancouver BC		6160na		
0600	0700		China, China Radio International				11710me
			11870af	11895as	13660as		15140af
			15350as	15465as	17505af		17540as
0600	0700		Cuba, Radio Havana Cuba		5970na		6000na
			6010na	6060na			
0600	0700	DRM	Germany, Deutsche Welle		3995eu		6130eu
0600	0700	vl	Guyana, Voice of Guyana		3290va		
0600	0700		Kuwait, Radio Kuwait		15110as		
0600	0700		Liberia, Star Radio		4025af		
0600	0700		Malaysia, RTM/Traxx FM		7295do		
0600	0700		Malaysia, RTM/Voice of Malaysia				6175as
			9750as	15295as			
0600	0700		Nigeria, Voice of Nigeria/External Service				
			15120eu				
0600	0700		Palau, T8WH/WHRI/Sound of Hope Radio				
			15700as				
0600	0700		Russia, Voice of Russia		15405pa		
0600	0700		South Africa, Channel Africa		7230af		
0600	0700		Swaziland, TWR Africa		4775af		6120af
			9500af				
0600	0700		Uganda, Radio Uganda		7195do		
0600	0700		UK, BBC World Service		3995eu		6005af
			6190af	7310af	9860af		12015af
			12095as	15105af	15310as		17640af
			17790as				
0600	0700	Sat/Sun	UK, BBC World Service		15420af		
0600	0700	DRM	UK, BBC World Service		3995eu		
0600	0700		USA, American Forces Network				4319usb
			5446usb	5765usb	7812usb	12133usb	
			12759usb	13362usb			
0600	0700		USA, EWTN/WEWN Vandiver AL				6890va
0600	0700		USA, Voice of America		6080af		12080af
			15580af				
0600	0700		USA, WBCQ Monticello ME		5110usb		7415usb

0600	0700		USA, WHRI Cypress Creek SC			5920am
			7365va	11565pa	15700am	
0600	0700		USA, WRMI Miami FL	9955ca		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WTWW Lebanon TN	9480na		
0600	0700		USA, WWCR Nashville TN	3215na	4840na	
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		USA, WYFR/Family Radio Worldwide			5850ca
			7520va	9680na	11530af	11580va
0600	0700		Zambia, 1 Africa Radio/CVC	6065af		13590af
0630	0645		Vatican City State, Vatican Radio			4005eu
			5965eu	7250eu	9645af	11740eu
			15595eu			
0630	0700		Bulgaria, Radio Bulgaria	9600eu		11600eu
0630	0700		Vatican City State, Vatican Radio			11625af
			13765af	15570af		
0645	0700	Sun	Germany, TWR Europe	6105eu		
0645	0700	Sun	Monaco, TWR Europe	9800eu		
0659	0700		New Zealand, Radio NZ International			6170pa
0659	0700	DRM	New Zealand, Radio NZ International			7440pa

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

0700	0727		Czech Republic, Radio Prague			9880eu
0700	0730	mtwhf	France, Radio France Internationale			13675af
0700	0730		Slovakia, Radio Slovakia International			9440va
			11650va			
0700	0730	Sun	UK, Bible Voice Broadcasting	5945eu		
0700	0745	Sat	UK, Bible Voice Broadcasting	5945eu		
0700	0745		USA, WYFR/Family Radio Worldwide			7520va
0700	0750	Sun	Germany, TWR Europe	6105eu		
0700	0750	mtwhf	Germany, TWR Europe	6105eu		
0700	0750	mtwhf	Monaco, TWR Europe	9800eu		
0700	0800		Anguilla, Worldwide Univ Network			6090am
0700	0800		Australia, ABC NT Alice Springs			4835do
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek			4910do
0700	0800		Australia, Radio Australia	9475as		9660pa
			9710as	11945pa	12080pa	
0700	0800		Bahrain, Radio Bahrain	6010me		
0700	0800	m/DRM	Belgium, TDP Radio	6015eu		
0700	0800		Canada, CFRX Toronto ON	6070na		
0700	0800		Canada, CFVP Calgary AB	6030na		
0700	0800		Canada, CKZN St John's NF	6160na		
0700	0800		Canada, CKZU Vancouver BC	6160na		
0700	0800		China, China Radio International			11895as
			13660as	13710eu	15125me	15350as
			17710as			
0700	0800	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0700	0800	DRM	Germany, Deutsche Welle	5790eu		9545eu
0700	0800	vl	Guyana, Voice of Guyana	3290va		
0700	0800		Kuwait, Radio Kuwait	15110as		
0700	0800		Liberia, Star Radio	4025af		
0700	0800		Malaysia, RTM/Traxx FM	7295do		
0700	0800		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0700	0800		Myanmar, Myanma Radio	9730do		
0700	0800		New Zealand, Radio NZ International			6170pa
0700	0800	DRM	New Zealand, Radio NZ International			7440pa
0700	0800		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as	15725as		
0700	0800		Russia, Voice of Russia	15405pa		17495va
0700	0800		South Africa, Channel Africa	7230af		
0700	0800		Swaziland, TWR Africa	4775af		6120af
			9500af			
0700	0800		Uganda, Radio Uganda	7195do		
0700	0800		UK, BBC World Service	5790eu		6190af
			9860af	11760me	11765af	13830af
			15400af	15575as	17790as	17830af
0700	0800	Sat/Sun	UK, BBC World Service	15420af		
0700	0800		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0700	0800		USA, EWTN/WEWN Vandiver AL			6890va
0700	0800		USA, WBCQ Monticello ME	5110usb		7415usb
0700	0800		USA, WHRI Cypress Creek SC			5920am
			7365va	9930va	11565pa	
0700	0800		USA, WRMI Miami FL	9955ca		
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WTWW Lebanon TN	9480na		
0700	0800		USA, WWCR Nashville TN	3215na	4840na	
0700	0800		USA, WWRB Manchester TN	3185na		
0700	0800		USA, WYFR/Family Radio Worldwide			5950na
			5985na	6875na	9385af	9505ca
0700	0800		Zambia, 1 Africa Radio/CVC	6065af		13590af
0715	0750	Sat	Germany, TWR Europe	6105eu		
0715	0750	Sat	Monaco, TWR Europe	9800eu		
0730	0800		Australia, HCJB Global Voice Australia			11750as
0730	0800		Clandestine, Cotton Tree News			15220af

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

0800	0830		Australia, ABC NT Alice Springs			4835do
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek			4910do
0800	0830		Myanmar, Myanma Radio	9730do		
0800	0845		USA, WYFR/Family Radio Worldwide			5950na
			5985na	9385af		
0800	0900		Anguilla, Worldwide Univ Network			6090am
0800	0900		Australia, HCJB Global Voice Australia			11750pa
0800	0900		Australia, Radio Australia	5995pa		9475as
			9580pa	9590pa	9710pa	11945pa
			12080pa	13630as		
0800	0900		Bahrain, Radio Bahrain	6010me		
0800	0900	t/DRM	Belgium, TDP Radio	6015eu		
0800	0900		Bhutan, Bhutan Broadcasting Service			6035as
0800	0900		Canada, CFRX Toronto ON	6070na		
0800	0900		Canada, CFVP Calgary AB	6030na		
0800	0900		Canada, CKZN St John's NF	6160na		
0800	0900		Canada, CKZU Vancouver BC	6160na		
0800	0900		China, China Radio International			11620as
			11895as	13710eu	15350as	15465as
			15625me	17540as		
0800	0900	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0800	0900	DRM	Germany, Deutsche Welle	12095as		
0800	0900	vl	Guyana, Voice of Guyana	3290va		
0800	0900		Liberia, Star Radio	4025af		
0800	0900		Malaysia, RTM/Traxx FM	7295do		
0800	0900		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0800	0900		New Zealand, Radio NZ International			6170pa
0800	0900	DRM	New Zealand, Radio NZ International			7440pa
0800	0900		Palau, T8WH/WHRI/Sound of Hope Radio			
			15725as			
0800	0900	mtwhfs	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0800	0900	DRM	Russia, Voice of Russia	12060eu		
0800	0900	Sun	South Africa, Amateur Radio Mirror Intl			7205af
			17570af			
0800	0900		South Africa, Channel Africa	9625af		
0800	0900		South Korea, KBS World Radio			9570as
0800	0900		Swaziland, TWR Africa	4775af		6120af
			9500af			
0800	0900		Uganda, Radio Uganda	7195do		
0800	0900		UK, BBC World Service	6190af		9860af
			11760me	15310as	15400af	15575as
			17640af	17790as	17830af	21470af
0800	0900		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0800	0900		USA, EWTN/WEWN Vandiver AL			6890va
0800	0900		USA, KNLS Anchor Point AK	11765as		
0800	0900		USA, WBCQ Monticello ME	5110usb		7415usb
0800	0900		USA, WHRI Cypress Creek SC			5920am
			9930pa	11565pa		
0800	0900		USA, WRMI Miami FL	9955ca		
0800	0900		USA, WTJC Newport NC	9370na		
0800	0900		USA, WTWW Lebanon TN	9480na		
0800	0900		USA, WWCR Nashville TN	3215na	4840na	
0800	0900		USA, WWRB Manchester TN	3185na		
0800	0900		USA, WYFR/Family Radio Worldwide			5985na
			6875na			
0800	0900		Zambia, 1 Africa Radio/CVC	6065af		13590af
0815	0825		Nepal, Radio Nepal	5005as		
0820	0900	smtwhf	Guam, KTWR/TWR	15170as		
0830	0900		Australia, ABC NT Alice Springs			2310do
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek			2325do
0830	0900	mtwhfa	Guam, KTWR/TWR	11840pa		

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

0900	0910	mtwhfa	Guam, KTWR/TWR	11840pa		
0900	0929		Czech Republic, Radio Prague			17650af
0900	0930		Australia, HCJB Global Voice Australia			11750pa
0900	0930	DRM	Bulgaria, Radio Bulgaria	11900eu		
0900	0930	mtwhfa	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0900	0959		Germany, Deutsche Welle	15640as		17820as
0900	1000		Anguilla, Worldwide Univ Network			6090am

0900	1000		Australia, ABC NT Alice Springs			2310do
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek			2325do
0900	1000		Australia, Radio Australia	9475as		9580pa
			9590pa	11945pa		
0900	1000		Bahrain, Radio Bahrain	6010me		
0900	1000	w/DRM	Belgium, TDP Radio	6015eu		
0900	1000		Canada, CFRX Toronto ON	6070na		
0900	1000		Canada, CFVP Calgary AB	6030na		
0900	1000		Canada, CKZN St John's NF	6160na		
0900	1000		Canada, CKZU Vancouver BC	6160na		
0900	1000		China, China Radio International			11620as
			13790pa	15210as	15270eu	15350as
			17490eu	17570eu	17750as	
0900	1000	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0900	1000	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0900	1000	2nd Sun	Germany, Blue Star Radio	6140eu		
0900	1000	4th Sun	Germany, Radio Gloria International			6140eu
0900	1000		Malaysia, RTM/Traxx FM	7295do		
0900	1000		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0900	1000		New Zealand, Radio NZ International			6170pa
0900	1000	DRM	New Zealand, Radio NZ International			7440pa
0900	1000		Nigeria, Voice of Nigeria/External Service			
			9690af			
0900	1000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0900	1000		Russia, Voice of Russia	17495pa		
0900	1000	DRM	Russia, Voice of Russia	12060eu		
0900	1000	3rd Sat	Slovakia, IRRS/Radio City	9510va		
0900	1000	1st Sat	Slovakia, IRRS/Radio Joystick	9510va		
0900	1000		Tajikistan, Voice of Tajik/External Svc			7245va
0900	1000		Uganda, Radio Uganda	7195do		
0900	1000	DRM	UK, BBC World Service	9610eu		13810eu
0900	1000		UK, BBC World Service	6190af		6195as
			9740as	9860af	11760me	15105as
			15310as	15400af	15575as	17640af
			17760as	17830af	21470af	21660as
0900	1000		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0900	1000		USA, EWTN/WEWN Vandiver AL			11520va
0900	1000		USA, WBCQ Monticello ME	5110usb		
0900	1000		USA, WHRI Cypress Creek SC			5920am
			7365na	9930pa	11565pa	
0900	1000		USA, WRMI Miami FL	9955ca		
0900	1000		USA, WTJC Newport NC	9370na		
0900	1000		USA, WTWW Lebanon TN	9480na		
0900	1000		USA, WWCR Nashville TN	4840na		9985na
0900	1000		USA, WWRB Manchester TN	3185na		
0900	1000		USA, WYFR/Family Radio Worldwide			5985na
			6875na	9465as	9755na	
0900	1000		Zambia, 1 Africa Radio/CVC	6065af		13590af
0930	1000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0930	1000		Saudi Arabia, BSKSA/Saudi Radio			15250af
0930	1000	Sun	Slovakia, IRRS/Euro Gospel Radio			9515va

1000 UTC - 6AM EDT / 5AM CDT / 3AM PDT

1000	1030		Czech Republic, Radio Prague			9955na
1000	1030		Japan, NHK World/ Radio Japan			9605as
			9625pa	9825pa	11780as	
1000	1030	fa	Philippines, FEBC	15325as		
1000	1030		Vietnam, Voice of Vietnam	9840as		12020as
1000	1057		Netherlands, R Netherlands Worldwide			11895as
			12065as	15110as		
1000	1057		North Korea, Voice of Korea	11710sa		11735sa
			13650as	15180sa		
1000	1058		New Zealand, Radio NZ International			6170pa
1000	1100		Anguilla, Worldwide Univ Network			11775am
1000	1100		Australia, ABC NT Alice Springs			2310do
1000	1100		Australia, ABC NT Katherine	2485do		
1000	1100		Australia, ABC NT Tennant Creek			2325do
1000	1100		Australia, Radio Australia	9475as		9580pa
			9590pa	11945pa		
1000	1100		Bahrain, Radio Bahrain	6010me		
1000	1100	h/DRM	Belgium, TDP Radio	6015eu		
1000	1100		Canada, CFRX Toronto ON	6070na		
1000	1100		Canada, CFVP Calgary AB	6030na		
1000	1100		Canada, CKZN St John's NF	6160na		
1000	1100		Canada, CKZU Vancouver BC	6160na		
1000	1100		China, China Radio International			6040na
			11610as	11635eu	13590as	13620as
			13720as	13790pa	15190as	15350as
			17490eu			
1000	1100	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
1000	1100	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1000	1100	DRM	Germany, Deutsche Welle	9545eu		13810eu
1000	1100	3rd Sun	Germany, European Music Radio			6140eu
1000	1100		India, All India Radio	7270as		13695pa
			15020as	15260as	15410as	17510pa
			17895pa			
1000	1100		Indonesia, Voice of Indonesia	9526va		11785al
1000	1100		Malaysia, RTM/Traxx FM	7295do		
1000	1100	DRM	New Zealand, Radio NZ International			7440pa
1000	1100		Nigeria, Voice of Nigeria/External Service			
			9690af			
1000	1100		Palau, T8WH/WHRI/Sound of Hope Radio			
			15725as			
1000	1100		Saudi Arabia, BSKSA/Saudi Radio			15250af
			15470af			
1000	1100	Sun	Slovakia, IRRS/Euro Gospel Radio			9515va
1000	1100		Uganda, Radio Uganda	7195do		
1000	1100	DRM	UK, BBC World Service	9545eu		13810eu
1000	1100	Sat/Sun	UK, BBC World Service	15400af		17830af
1000	1100		UK, BBC World Service	6190af		6195as
			9545eu	9740as	9860af	11760me
			15285as	15310as	15575as	17640af
			17790as	21470af	21660as	
1000	1100		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1000	1100		USA, EWTN/WEWN Vandiver AL			11520va
1000	1100		USA, KNLS Anchor Point AK	11765as		
1000	1100		USA, WHRI Cypress Creek SC			5920am
			9930pa	11565pa	15725pa	
1000	1100	vl	USA, WINB Red Lion PA	9265ca		
1000	1100		USA, WRMI Miami FL	9955ca		
1000	1100		USA, WTJC Newport NC	9370na		
1000	1100		USA, WTWW Lebanon TN	9480na		
1000	1100		USA, WWCR Nashville TN	4840na		9985na
1000	1100		USA, WWRB Manchester TN	3185na		
1000	1100		USA, WYFR/Family Radio Worldwide			5950na
			5985na	6875na	9450as	9465as
			9755na			
1000	1100		Zambia, 1 Africa Radio/CVC	6065af		13590af
1030	1057		Czech Republic, Radio Prague			9880eu
1030	1100		Iran, VOIRI/IRIB	15600as	17660as	
1030	1100		Mongolia, Voice of Mongolia	12085as		
1059	1100		New Zealand, Radio NZ International			9655pa

1100 UTC - 7AM EDT / 6AM CDT / 4AM PDT

1100	1127		Iran, VOIRI/IRIB	15600as	17660as	
1100	1130	f/DRM	Japan, NHK World/ Radio Japan			9760eu
1100	1130		Pakistan, PBC/ Radio Pakistan	15100as		17720as
1100	1130	Sat/DRM	South Korea, KBS World Radio			9760eu
1100	1130	mtwhf	UK, BBC World Service	15400af		
1100	1130		Vietnam, Voice of Vietnam	7285as		
1100	1145		USA, WYFR/Family Radio Worldwide			6875na
			9550sa	9755na		
1100	1156		Romania, Radio Romania International			15210eu
			15430eu	17510af	17670af	
1100	1158	DRM	New Zealand, Radio NZ International			7440pa
1100	1200		Anguilla, Worldwide Univ Network			11775am
1100	1200		Australia, ABC NT Alice Springs			2310do
1100	1200		Australia, ABC NT Katherine	2485do		
1100	1200		Australia, ABC NT Tennant Creek			2325do
1100	1200		Australia, Radio Australia	5995pa		6020pa
			9475as	9580pa	9590pa	9965as
			11945pa			
1100	1200	DRM	Australia, Radio Australia	12080pa		
1100	1200		Bahrain, Radio Bahrain	6010me		
1100	1200	f/DRM	Belgium, TDP Radio	6015eu		
1100	1200	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1100	1200		Canada, CFRX Toronto ON	6070na		
1100	1200		Canada, CFVP Calgary AB	6030na		
1100	1200		Canada, CKZN St John's NF	6160na		
1100	1200		Canada, CKZU Vancouver BC	6160na		
1100	1200		China, China Radio International			5955as
			6040na	11650as	11660as	11750na
			11795as	13590as	13645as	13650eu
			13720as	17490eu		
1100	1200	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
1100	1200	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1100	1200		Malaysia, RTM/Traxx FM	7295do		
1100	1200		New Zealand, Radio NZ International			9655pa
1100	1200		Nigeria, Voice of Nigeria/External Service			
			9690af			
1100	1200		Saudi Arabia, BSKSA/Saudi Radio			15250af
			15470af			
1100	1200	Sun	Slovakia, IRRS/Euro Gospel Radio			9515va

1100	1200		Taiwan, Radio Taiwan International			7445as
			11715as			
1100	1200		Uganda, Radio Uganda	7195do		
1100	1200		UK, BBC World Service	6190af		6195as
			9545eu	9740as	9860af	11760me
			15280as	15310as	15575as	17640af
			17790as	17830af	21470af	
1100	1200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1100	1200		USA, EWTN/WEWN Vandiver AL			11520va
1100	1200		USA, WHRI Cypress Creek SC			5920am
			7315am			
1100	1200	vl	USA, WINB Red Lion PA	9265ca		
1100	1200		USA, WRMI Miami FL	9955ca		
1100	1200		USA, WTJC Newport NC	9370na		
1100	1200		USA, WTWW Lebanon TN	5080na		
1100	1200		USA, WWCR Nashville TN	4840na		5890na
			15825na			
1100	1200		USA, WWRB Manchester TN	3185na		
1100	1200		USA, WYFR/Family Radio Worldwide			5950na
			5985na	7730sa	9625sa	15560as
1100	1200		Zambia, 1 Africa Radio/CVC	6065af		13590af
1130	1200	Sat/Sun	Australia, HCJB Global Voice Australia			15400as
1130	1200	f	Vatican City State, Vatican Radio/Mass			15595me
			17765me			
1130	1200		Vietnam, Voice of Vietnam	9840as		12020as
1145	1200	Sat/Sun	UK, Bible Voice Broadcasting	7245as		

1200 UTC - 8AM EDT / 7AM CDT / 5AM PDT

1200	1215		Nepal, Radio Nepal	5005as		
1200	1215	Sat/Sun	UK, Bible Voice Broadcasting	7245as		
1200	1215	mtwhfa	Vatican City State, Vatican Radio			9830am
1200	1230	mtwhf	France, Radio France Internationale			17800af
			21620af			
1200	1230		Germany, AWR Europe	15435as		
1200	1230		Japan, NHK World/ Radio Japan			6120na
			9625pa	9695as	9790eu	
1200	1230		Saudi Arabia, BSKSA/Saudi Radio			15250af
1200	1245		USA, WYFR/Family Radio Worldwide			5950na
			5985na			
1200	1258		New Zealand, Radio NZ International			9655pa
1200	1259		Poland, Polskie Radio Warsaw			11675eu
			11980eu			
1200	1300		Anguilla, Worldwide Univ Network			11775am
1200	1300		Australia, ABC NT Alice Springs			2310do
1200	1300		Australia, ABC NT Katherine	2485do		
1200	1300		Australia, ABC NT Tennant Creek			2325do
1200	1300	Sat/Sun	Australia, HCJB Global Voice Australia			15400as
1200	1300		Australia, Radio Australia	6020pa		9475as
			9580pa	9965as	11945pa	
1200	1300	DRM	Australia, Radio Australia	5995pa		
1200	1300		Bahrain, Radio Bahrain	6010me		
1200	1300	a/DRM	Belgium, TDP Radio	6015eu		
1200	1300	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1200	1300		Canada, CFRX Toronto ON	6070na		
1200	1300		Canada, CFVP Calgary AB	6030na		
1200	1300		Canada, CKZN St John's NF	6160na		
1200	1300		Canada, CKZU Vancouver BC	6160na		
1200	1300		China, China Radio International			5955as
			9460as	9660as	9730as	9760pa
			11650as	11660as	11690me	11760pa
			11980as	13645as	13650eu	13790eu
			17490eu			
1200	1300	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1200	1300	mtwhf	Ethiopia, Radio Ethiopia/National Service			5990do
			7110do	9704do		
1200	1300	DRM	Germany, Deutsche Welle	9545eu		13810eu
1200	1300		Malaysia, RTM/Traxx FM	7295do		
1200	1300		Nigeria, Voice of Nigeria/External Service			
			9690af			
1200	1300	mwfs	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1200	1300		Russia, Voice of Russia	11500as		
1200	1300		Saudi Arabia, BSKSA/Saudi Radio			15470af
1200	1300		South Korea, KBS World Radio			9650na
1200	1300		Uganda, Radio Uganda	7195do		
1200	1300		UK, BBC World Service	5875as		6190af
			6195as	9545eu	9740as	9860af
			11750as	11760me	15310as	15575as
			17640af	17790as	17830af	
1200	1300		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1200	1300		USA, EWTN/WEWN Vandiver AL			11520va
1200	1300		USA, KNLS Anchor Point AK	7355as		9680as
1200	1300		USA, Voice of America	7575va		9510va
			9760va	12075va		
1200	1300		USA, WBCQ Monticello ME	9330am		
1200	1300		USA, WHRI Cypress Creek SC			5920am
			7315am	9930pa		
1200	1300	Sat/Sun	USA, WHRI Cypress Creek SC			9410na
1200	1300	vl	USA, WINB Red Lion PA	9265ca		
1200	1300		USA, WRMI Miami FL	9955ca		
1200	1300		USA, WTJC Newport NC	9370na		
1200	1300		USA, WTWW Lebanon TN	9479na		
1200	1300		USA, WWCR Nashville TN	7490af		9980na
			13845na	15825na		
1200	1300		USA, WWRB Manchester TN	3185na		
1200	1300		USA, WYFR/Family Radio Worldwide			17555sa
			17795na			
1200	1300		Zambia, 1 Africa Radio/CVC	6065af		13590af
1215	1300		Egypt, Radio Cairo	17870as		
1215	1300	mtwhyf	UK, BBC World Service	9410ca		11860ca
1230	1300	mtwhf	Australia, HCJB Global Voice Australia			15400as
1230	1300		Bangladesh, Bangladesh Betar			7250as
1230	1300	Sat	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1230	1300		Thailand, Radio Thailand World Service			9890va
1230	1300		Vietnam, Voice of Vietnam	9840as		12020as
1230	13000		Turkey, Voice of Turkey	15450eu		15520as

1300 UTC - 9AM EDT / 8AM CDT / 6AM PDT

1300	1329		Czech Republic, Radio Prague			11600eu
1300	1330		Australia, HCJB Global Voice Australia			15400as
1300	1330		Egypt, Radio Cairo	17870as		
1300	1330		Japan, NHK World/ Radio Japan			11985as
1300	1330		Turkey, Voice of Turkey	15450as		15520eu
1300	1330	Sun	USA, WHRI Cypress Creek SC			11785na
1300	1357		North Korea, Voice of Korea	9335eu		11710na
			13760as	15245eu		
1300	1400		Anguilla, Worldwide Univ Network			11775am
1300	1400		Australia, ABC NT Alice Springs			2310do
1300	1400		Australia, ABC NT Katherine	2485do		
1300	1400		Australia, Radio Australia	6020pa		9580pa
			9590pa			
1300	1400	DRM	Australia, Radio Australia	5995pa		
1300	1400		Bahrain, Radio Bahrain	6010me		
1300	1400	s/DRM	Belgium, TDP Radio	6015na		
1300	1400	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1300	1400		Canada, CFRX Toronto ON	6070na		
1300	1400		Canada, CFVP Calgary AB	6030na		
1300	1400		Canada, CKZN St John's NF	6160na		
1300	1400		Canada, CKZU Vancouver BC	6160na		
1300	1400		China, China Radio International			5995as
			9570na	9650na	9730as	9765as
			9870as	11660as	11760me	11980as
			13610eu	13755as	15260na	
1300	1400	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1300	1400		Indonesia, Voice of Indonesia	9526va		11785al
1300	1400		Malaysia, RTM/Traxx FM	7295do		
1300	1400		New Zealand, Radio NZ International			6170pa
1300	1400		Nigeria, Voice of Nigeria/External Service			
			9690af			
1300	1400		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1300	1400		South Korea, KBS World Radio			9770as
1300	1400		Tajikistan, Voice of Tajik/External Svc			7245va
1300	1400		Uganda, Radio Uganda	4975do		
1300	1400		UK, BBC World Service	5875as		6190af
			6195as	9545eu	9740as	9860af
			11760me	15310as	15420af	15575as
			17640af	17790as	17830af	21470af
1300	1400		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1300	1400		USA, EWTN/WEWN Vandiver AL			13835eu
1300	1400		USA, KJES Vado NM	11715na		
1300	1400		USA, KJES Vado, NM	11715na		
1300	1400	Sat/Sun	USA, Voice of America	7575va		9510va
			9760va			
1300	1400		USA, WBCQ Monticello ME	9330am		
1300	1400	Sat/Sun	USA, WHRI Cypress Creek SC			9495am
			9840na			
1300	1400		USA, WHRI Cypress Creek SC			9930pa
1300	1400	vl	USA, WINB Red Lion PA	9265ca		
1300	1400		USA, WRMI Miami FL	9955ca		
1300	1400		USA, WTJC Newport NC	9370na		
1300	1400		USA, WTWW Lebanon TN	9479na		
1300	1400		USA, WWCR Nashville TN	7490af		9980na
			13845na	15825na		

1300	1400		USA, WWRB Manchester TN	9385na		
1300	1400		USA, WYFR/Family Radio Worldwide	11520as		
			11560as	11830na	11910na	12155as
			13820as	17795na		
1300	1400		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1305	1400	Sun	Greece, Voice of Greece	9420va	15630va	
1330	1400	mta	Guam, KSDA/ AWR	11860as		
1330	1400		India, All India Radio	9690as	11620as	
			13710as			
1330	1400		Laos, Lao National Radio	7145as		
1330	1400		Sweden, Radio Sweden	15735va		
1330	1400	Sat/Sun	USA, WHRI Cypress Creek SC	11785na		
1330	1400		Vietnam, Voice of Vietnam	9840as	12020as	

1400 UTC - 10AM EDT / 9AM CDT / 7AM PDT

1400	1425	mh	Guam, KTWR/TWR	9975as		
1400	1430		China, CNR-11/Holy Tibet	6010do	7350do	
			9480do			
1400	1430	Sun	Germany, Pan American Broadcasting	15205as		
1400	1430	`	Japan, NHK World/ Radio Japan	11705as		
			11985as	21560va		
1400	1430		Thailand, Radio Thailand World Service	9575va		
1400	1430	Sun	United Arab Emirates, FEBA Radio	12025as		
1400	1435	twfas	Guam, KTWR/TWR	9975as		
1400	1500		Anguilla, Worldwide Univ Network	11775am		
1400	1500		Australia, ABC NT Alice Springs	2310do		
1400	1500		Australia, ABC NT Katherine	2485do		
1400	1500		Australia, ABC NT Tennant Creek	2325do		
1400	1500		Australia, Radio Australia	6080pa	7240pa	
			9590pa			
1400	1500		Bahrain, Radio Bahrain	6010me		
1400	1500	DRM	Belgium, TDP Radio/Disco Palace	6015eu		
1400	1500		Bhutan, Bhutan Broadcasting Service	6035as		
1400	1500	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1400	1500		Canada, CFRX Toronto ON	6070na		
1400	1500		Canada, CFVP Calgary AB	6030na		
1400	1500		Canada, CKZN St John's NF	6160na		
1400	1500		Canada, CKZU Vancouver BC	6160na		
1400	1500		China, China Radio International	5955as		
			9765as	9870as	11665as	11675as
			11765eu	13710as	13740na	13790eu
			17630as			
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1400	1500		India, All India Radio	9690as	11620as	
			13710as			
1400	1500		Libya, LJB/Voice of Africa	17725af	21695af	
1400	1500		Malaysia, RTM/Traxx FM	7295do		
1400	1500		Netherlands, R Netherlands Worldwide	11835as		
			15745as			
1400	1500		New Zealand, Radio NZ International	6170pa		
1400	1500		Nigeria, Voice of Nigeria/External Service			
			9690af			
1400	1500		Oman, Radio Oman	15140va		
1400	1500		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1400	1500		Russia, Voice of Russia	4975va	9455as	
			11500as			
1400	1500	DRM	Russia, Voice of Russia	9750eu		
1400	1500		South Africa, Channel Africa	9625af		
1400	1500		Uganda, Radio Uganda	4975do		
1400	1500		UK, BBC World Service	5790eu	5875as	
			6190af	6195as	7230af	9740as
			11920as	12095as	15310as	17640af
			17830af	21470af		
1400	1500	DRM	UK, BBC World Service	9545eu	13590eu	
1400	1500	Sat	UK, Bible Voice Broadcasting	15265as		
1400	1500		United States, Overcomer Ministries	6110eu		
			13810va			
1400	1500		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1400	1500		USA, EWTN/WEWN Vandiver AL	13835as		
1400	1500		USA, KJES Vado NM	11715am		
1400	1500		USA, KNLS Anchor Point AK	11765as		
1400	1500		USA, Voice of America	6080af	12080af	
			15530va	15580af	17740va	17585af
1400	1500	mtwhf	USA, Voice of America	7540va	7575va	
			9760va			
1400	1500		USA, WBCQ Monticello ME	9330am		
1400	1500	Sat/Sun	USA, WHRI Cypress Creek SC	9840na		
			11785na	17510am		
1400	1500		USA, WHRI Cypress Creek SC	9930pa		
1400	1500	vl	USA, WINB Red Lion PA	9265ca		
1400	1500		USA, WJHR International Milton FL	15550usb		
1400	1500		USA, WRMI Miami FL	9955ca		
1400	1500		USA, WTJC Newport NC	9370na		
1400	1500		USA, WTWW Lebanon TN	9479na		
1400	1500		USA, WWCR Nashville TN	7490af	9980na	
			13845na	15825na		
1400	1500		USA, WWRB Manchester TN	9385na		
1400	1500		USA, WYFR/Family Radio Worldwide	9365as		
			9615as	9865as	11560as	11725as
			11830na	11910na	13695na	17795na
1400	1500		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1415	1430	mtwhfa	Germany, Pan American Broadcasting	15205as		
1415	1430		Nepal, Radio Nepal	5005as		
1415	1430	mwh	United Arab Emirates, FEBA Radio	12025as		
1415	1500	Sun	UK, Bible Voice Broadcasting	15265as		
1425	1455	mtwhf	Swaziland, TWR Africa	6065af		
1430	1445	Sun	Germany, Pan American Broadcasting	15205as		
1430	1459		China, CNR-2/Business Radio	6055do	6155do	
			7245as	7315as	7335as	7375as
			9820as			
1430	1500	mtwhfa	Albania, Radio Tirana	13625na		
1430	1500		Australia, Radio Australia	9475as	11660as	
1430	1500		China, China Radio International	7325as		
			11695as	12110as		
1430	1500		Sweden, Radio Sweden	13820va		
1445	1500	Sat/Sun	Australia, HCJB Global Voice Australia	15340as		

1500 UTC - 11AM EDT / 10AM CDT / 8AM PDT

1500	1510	mtwhfa	Turkmenistan, Turkmen Radiosi	5015eu		
1500	1515	Sun	UK, Bible Voice Broadcasting	13740as		
1500	1530		Australia, HCJB Global Voice Australia	15340as		
1500	1530	Sun	China, Voice of the Strait	4940do	9505do	
1500	1530		Guam, KSDA/ AWR	11720as		
1500	1530		UK, BBC World Service	7405af	11860af	
			15420af			
1500	1530		Vietnam, Voice of Vietnam	7285as	9840as	
			12020as			
1500	1545		USA, WYFR/Family Radio Worldwide	15770sa		
1500	1550		New Zealand, Radio NZ International	6170pa		
1500	1557		Canada, Radio Canada International	15125as		
			11975as			
1500	1557		Libya, LJB/Voice of Africa	17725af	21695af	
1500	1557		Netherlands, R Netherlands Worldwide	11835as		
			15745as			
1500	1557		North Korea, Voice of Korea	9335eu	11710na	
			13760na	15245eu		
1500	1600		Anguilla, Worldwide Univ Network	11775am		
1500	1600		Australia, ABC NT Alice Springs	2310do		
1500	1600		Australia, ABC NT Katherine	2485do		
1500	1600		Australia, Radio Australia	5995pa	6080pa	
			7240pa	9475as	9590pa	11660as
1500	1600		Bahrain, Radio Bahrain	6010me		
1500	1600	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1500	1600		Canada, CFRX Toronto ON	6070na		
1500	1600		Canada, CFVP Calgary AB	6030na		
1500	1600		Canada, CKZN St John's NF	6160na		
1500	1600		Canada, CKZU Vancouver BC	6160na		
1500	1600		China, China Radio International	5955as		
			6095me	7325as	7410as	9720me
			9870as	9800as	11965eu	13640eu
			13740na	17630as		
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1500	1600		Malaysia, RTM/Traxx FM	7295do		
1500	1600		Myanmar, Myanma Radio	5985as		
1500	1600		Nigeria, Voice of Nigeria/External Service			
			15120af			
1500	1600		Russia, Voice of Russia	4975va	9455as	
			9735me	11985va	12040eu	13855af
			11985af			
1500	1600		South Africa, Channel Africa	9625af		
1500	1600		Uganda, Dunamis Shortwave	4750af		
1500	1600		Uganda, Radio Uganda	4975do		
1500	1600		UK, BBC World Service	5790eu	5875as	
			6575as	6190af	6195as	7230af
			9740as	11920as	12095eu	15310as
			15400af	17640af	17830af	21470af
1500	1600	DRM	UK, BBC World Service	5790eu	13590eu	
1500	1600		United States, Overcomer Ministries	6110eu		
			13810va	17485eu		
1500	1600		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1500	1600		USA, EWTN/WEWN Vandiver AL	13835as		
1500	1600		USA, Voice of America	4930af	7540va	
			7575va	12080af	12150va	13750va
			15530va	15580af	17895af	
1500	1600		USA, Voice of America/Special English	6140va		
			7520va	9485va	9760va	

1500	1600		USA, WBCQ Monticello ME	9330am		
1500	1600	Sat	USA, WHRI Cypress Creek SC			17510va
1500	1600	Sat/Sun	USA, WHRI Cypress Creek SC			9840na
			11785na			
1500	1600	Sun	USA, WHRI Cypress Creek SC			15195na
1500	1600	vl	USA, WINB Red Lion PA	13570ca		
1500	1600		USA, WJHR International Milton FL			15550usb
1500	1600		USA, WRMI Miami FL	9955na		
1500	1600		USA, WTJC Newport NC	9370na		
1500	1600		USA, WTWW Lebanon TN	9479na		
1500	1600		USA, WWCR Nashville TN	7490af	9980na	
			13845na	15825na		
1500	1600		USA, WWRB Manchester TN	9385na		
1500	1600		USA, WYFR/Family Radio Worldwide			6280as
			11605as	11830na	11910na	15520na
			17795na			
1500	1600		Zambia, 1 Africa Radio/CVC	6065af		13590af
1505	1600	DRM	Canada, Radio Canada International			9800na
1505	1600		Canada, Radio Canada International			9515as
1515	1545	Sat	UK, Bible Voice Broadcasting	13740as		
1525	1600	Sat/Sun	Swaziland, TWR Africa	6025af		
1530	1550		Vatican City State, Vatican Radio			13765as
			15235as			
1530	1600		China, Xizang PBS/Holy Tibet	4905do		4920do
			5240do	6110do	6130do	6200do
			7255do	7385do		
1530	1600		Germany, AWR Europe	15255as		
1530	1600		Iran, VOIRI/IRIB	7305as	9600as	
1530	1600		Mongolia, Voice of Mongolia	9665as		12085as
1530	1600		Sweden, Radio Sweden	13870va		13600al
1530	1600	h	UK, Bible Voice Broadcasting	13740as		
1530	1600	Sun	UK, Bible Voice Broadcasting	13590me		
1530	1600		Vatican City State, Vatican Radio			11850as
1545	1600	m	UK, Bible Voice Broadcasting	13590me		
1545	1600	twhfa	UK, Bible Voice Broadcasting	13590me		
1551	1600		New Zealand, Radio NZ International			7440pa
1551	1600	DRM	New Zealand, Radio NZ International			6170pa

1600 UTC - 12PM EDT / 11AM CDT / 9AM PDT

1600	1605	Sun	Croatia, Croatian Radio	6165eu		
1600	1615	mtwhfa	Croatia, Croatian Radio	6165eu		
1600	1615		Pakistan, PBC/ Radio Pakistan	7530me		11565af
			11585af			
1600	1615	f	UK, Bible Voice Broadcasting	13590me		
1600	1625	Sat/Sun	Swaziland, TWR Africa	6025af		
1600	1627		Czech Republic, Radio Prague			9740eu
1600	1627		Iran, VOIRI/IRIB	7305as	9600as	
1600	1630	Sun	Germany, Pan American Broadcasting			13830me
1600	1630		Guam, KSDA/ AWR	11720as		11805as
1600	1630		Myanmar, Myanma Radio	9730do		
1600	1630		Vietnam, Voice of Vietnam	7220me		7280eu
			9550me	9730eu		
1600	1645	h	UK, Bible Voice Broadcasting	13590me		
1600	1645		USA, WYFR/Family Radio Worldwide			11830na
			11865na			
1600	1657		North Korea, Voice of Korea	9990na		11545va
1600	1700		Anguilla, Worldwide Univ Network			11775am
1600	1700		Australia, ABC NT Alice Springs			2310do
1600	1700		Australia, ABC NT Katherine	2485do		
1600	1700		Australia, Radio Australia	5995pa		6080pa
			7240pa	9465as	9710pa	11660as
1600	1700		Bahrain, Radio Bahrain	6010me		
1600	1700	Sat	Canada, CBC NQ SW Service	9625na		
1600	1700		Canada, CFRX Toronto ON	6070na		
1600	1700		Canada, CFVP Calgary AB	6030na		
1600	1700		Canada, CKZN St John's NF	6160na		
1600	1700		Canada, CKZU Vancouver BC	6160na		
1600	1700		Canada, Radio Canada International			9515as
1600	1700	DRM	Canada, Radio Canada International			9800na
1600	1700		China, China Radio International			6060as
			7235as	7420af	9570af	11900af
			11940eu	11965eu	13760eu	
1600	1700		Egypt, Radio Cairo	12170af		
1600	1700		Ethiopia, Radio Ethiopia/External Service			7165va
			9560af			
1600	1700	mtwhf	France, Radio France Internationale			15605af
			17605af			
1600	1700		Germany, Deutsche Welle	6170as		9485as
			9540as	15410as		
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		New Zealand, Radio NZ International			7440pa
1600	1700	DRM	New Zealand, Radio NZ International			6170pa
1600	1700		Russia, Voice of Russia	4975va		11985va
			11985af	12040eu	13855af	
1600	1700		South Korea, KBS World Radio			9515eu
1600	1700		Taiwan, Radio Taiwan International			11550as
			13840as			
1600	1700		Uganda, Dunamis Shortwave	4750af		
1600	1700		Uganda, Radio Uganda	4975do		
1600	1700		UK, BBC World Service	3255af		5790eu
			5850as	5975as	6190af	9695as
			12095eu	15400af	17640af	17795af
			17830af	21470af		
1600	1700	DRM	UK, BBC World Service	3995eu		5790eu
1600	1700	Sat/Sun	UK, Bible Voice Broadcasting	13590me		
1600	1700		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1600	1700		USA, EWTN/WEWN Vandiver AL			15610va
1600	1700		USA, Voice of America	4930af		6080af
			15580af			
1600	1700		USA, Voice of America/Special English			11890va
			12080va	13570va		
1600	1700		USA, WBCQ Monticello ME	9330am		
1600	1700		USA, WHRI Cypress Creek SC			9840na
			11785na	17520af		
1600	1700	vl	USA, WINB Red Lion PA	13570ca		
1600	1700		USA, WJHR International Milton FL			15550usb
1600	1700		USA, WRMI Miami FL	9955na		
1600	1700		USA, WTJC Newport NC	9370na		
1600	1700		USA, WTWW Lebanon TN	9479na		
1600	1700		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN	9385na		
1600	1700		USA, WYFR/Family Radio Worldwide			6010af
			6085ca	7270af	11850as	13695na
			17545af	17795na	18980va	21455va
			21525af			
1600	1700		Zambia, 1 Africa Radio/CVC	6065af		13590af
1615	1630	mtwhf	Swaziland, TWR Africa	6130af		
1615	1630		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu	9645eu	15595va
1615	1700	Sun	UK, BBC World Service	7405af		11860af
			15420af			
1630	1700		Guam, KSDA/ AWR	11740as		
1630	1700		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1630	1700		Slovakia, Radio Slovakia International			5920eu
			6055eu			
1630	1700	Sat/Sun	Swaziland, TWR Africa	6130af		
1630	1700	Sat	UK, BBC World Service	11860af		
1630	1700	mtwhf	UK, BBC World Service	15420af		
1630	1700		USA, WHRI Cypress Creek SC			9930pa
1640	1650	mtwhfa	Turkmenistan, Turkmen Radiosi			4930eu

1700 UTC - 1PM EDT / 12PM CDT / 10AM PDT

1700	1705		Canada, Radio Canada International			9515as
1700	1705	DRM	Canada, Radio Canada International			9800na
1700	1715	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
1700	1715		UK, Bible Voice Broadcasting	13590me		
1700	1727		Czech Republic, Radio Prague			9740eu
1700	1730	DRM	Romania, Radio Romania International			7350eu
1700	1730		Sweden, Radio Sweden	13600va		13870va
1700	1730		USA, Voice of America	6080af		12015af
			15580af	17895af		
1700	1730		Vietnam, Voice of Vietnam	9725eu		
1700	1746		UK, BBC World Service	6005af		9410af
1700	1756	DRM	Romania, Radio Romania International			9535eu
1700	1756		Romania, Radio Romania International			11735eu
1700	1759		Canada, Radio Canada International			5850na
1700	1759		Poland, Polskie Radio Warsaw			7265eu
			9770eu			
1700	1800		Anguilla, Worldwide Univ Network			11775am
1700	1800		Australia, ABC NT Alice Springs			2310do
1700	1800		Australia, ABC NT Katherine	2485do		
1700	1800		Australia, Radio Australia	5995pa		6080pa
			9475as	9510pa	9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain	6010me		
1700	1800	Sat	Canada, CBC NQ SW Service	9625na		
1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St John's NF	6160na		
1700	1800		Canada, CKZU Vancouver BC	6160na		
1700	1800		China, China Radio International			6090as
			6140as	6145eu	6165me	7235as
			7265af	7410as	7420as	9570af
			9695eu	11900af	13760eu	
1700	1800		Egypt, Radio Cairo	12170af		
1700	1800		Equatorial Guinea, Radio Africa			7190af
			15190af			
1700	1800	DRM	Germany, Deutsche Welle	5790eu		
1700	1800		Kuwait, Radio Kuwait	11990va		

1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		New Zealand, Radio NZ International	7440pa		
1700	1800	DRM	New Zealand, Radio NZ International	6170pa		
1700	1800		Nigeria, Voice of Nigeria/External Service	15120af		
1700	1800		Palau, T8WH/WHRI/Sound of Hope Radio	9930va		
1700	1800		Russia, Voice of Russia	4975va	11985va	
			12040eu	13855af		
1700	1800		South Africa, Channel Africa	9675af		
1700	1800		Swaziland, TWR Africa	3200af	9500af	
1700	1800		Taiwan, Radio Taiwan International	15690af		
1700	1800		Tajikistan, Voice of Tajik/External Svc	7245va		
1700	1800		Uganda, Dunamis Shortwave	4750af		
1700	1800		Uganda, Radio Uganda	4975do		
1700	1800		UK, BBC World Service	3255af	5790eu	
			5850as	5875eu	5975as	6190af
			7405af	9810as	12095af	13675eu
			15400af	17795af	17830af	
1700	1800	DRM	UK, BBC World Service	3995eu		
1700	1800	Sat	UK, Bible Voice Broadcasting	9645me		
1700	1800	Sat/Sun	UK, Bible Voice Broadcasting	13590me		
1700	1800		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1700	1800		USA, EWTN/WEWN Vandiver AL	15610va		
1700	1800		USA, WBCQ Monticello ME	9330am	15420usb	
1700	1800	mtwhfs	USA, WHRI Cypress Creek SC	9840na		
1700	1800	Sat	USA, WHRI Cypress Creek SC	17520am		
1700	1800		USA, WHRI Cypress Creek SC	11785na		
			17520af			
1700	1800	vl	USA, WINB Red Lion PA	13570ca		
1700	1800		USA, WJHR International Milton FL	15550usb		
1700	1800		USA, WRMI Miami FL	9955ca		
1700	1800		USA, WTJC Newport NC	9370na		
1700	1800		USA, WTWW Lebanon TN	9479na		
1700	1800		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN	9385na		
1700	1800		USA, WYFR/Family Radio Worldwide	7395af		
			13690na	17545af	17795na	18980va
			21455va			
1700	1800		Zambia, 1 Africa Radio/CVC	4965af	13590af	
1720	1740	Sat/Sun	USA, Voice of America/Studio 7	4930af		
			11605af	15775af		
1730	1740	fas	USA, Voice of America	4930af	11605af	
			15775af			
1730	1800		Bulgaria, Radio Bulgaria	5900eu	7400eu	
1730	1800	DRM	Bulgaria, Radio Bulgaria	9400eu		
1730	1800		Clandestine, Sudan Radio Service/ SRS	9590af		
1730	1800		UK, Bible Voice Broadcasting	13590me		
1730	1800	Sun	UK, Bible Voice Broadcasting	9645me		
1730	1800		USA, Voice of America	12015af	15580af	
			17895af			
1730	1800	mtwhf	USA, Voice of America/Studio 7	4930af		
			11605af	15775af		
1730	1800		Vatican City State, Vatican Radio	11625af		
			13765af	15570af		
1745	1800		Bangladesh, Bangladesh Betar	7250as		
1745	1800	DRM	India, All India Radio	9950eu		
1745	1800		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1745	1800	mtwhf	Moldova, (Transnistria) Radio PMR	6240na		
1755	1800		Clandestine, Radio Dialogue	4895af		

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

1800	1810	Sun	UK, Bible Voice Broadcasting	13590me		
1800	1815		Clandestine, Radio Dialogue	4895af		
1800	1830	w	Austria, AWR Europe	9755af		
1800	1830		South Africa, AWR	3215af	3345af	9610af
1800	1830		UK, BBC World Service	5875as	5975as	
1800	1830	Sun	UK, Bible Voice Broadcasting	9430me		
1800	1830		USA, Voice of America	6080af	9850af	
			12015af	15580af		
1800	1830	fa	USA, Voice of America	4930af	11605af	
			15775af			
1800	1835		New Zealand, Radio NZ International	7440pa		
1800	1835	DRM	New Zealand, Radio NZ International	6170pa		
1800	1857		Netherlands, R Netherlands Worldwide	6020af		
1800	1857		North Korea, Voice of Korea	13760af	15245eu	
1800	1859		Canada, Radio Canada International	9530af		
			11765af	17735af	17810af	
1800	1900		Anguilla, Worldwide Univ Network	11775am		
1800	1900	mtwhf	Argentina, Radio Nacional RAE	9690eu		
			15345eu			
1800	1900		Australia, ABC NT Alice Springs	2310do		
1800	1900		Australia, ABC NT Katherine	2485do		
1800	1900		Australia, Radio Australia	6080pa	7240pa	
			9475as	9510pa	9710pa	11880pa
1800	1900		Bahrain, Radio Bahrain	6010me		
1800	1900		Bangladesh, Bangladesh Betar	7250eu		
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St John's NF	6160na		
1800	1900		Canada, CKZU Vancouver BC	6160na		
1800	1900		China, China Radio International	9600eu		
			13760eu			
1800	1900		Equatorial Guinea, Radio Africa	7190af		
			15190af			
1800	1900	DRM	Germany, Deutsche Welle	5790eu		
1800	1900	DRM	India, All India Radio	9950eu		
1800	1900		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1800	1900		Kuwait, Radio Kuwait	15540va		
1800	1900		Liberia, Star Radio	4025af		
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900		Netherlands, R Netherlands Worldwide	12045af		
			15535af			
1800	1900		Nigeria, Voice of Nigeria/External Service	15120af		
1800	1900		Palau, T8WH/WHRI/Sound of Hope Radio	9930va	9955as	
1800	1900	DRM	Poland, Polskie Radio Warsaw	6130eu		
1800	1900		Russia, Voice of Russia	4975va	12040eu	
1800	1900		South Korea, KBS World Radio	7275eu		
1800	1900		Swaziland, TWR Africa	3200af	9500af	
1800	1900		Taiwan, Radio Taiwan International	6155eu		
1800	1900		Uganda, Dunamis Shortwave	4750af		
1800	1900		Uganda, Radio Uganda	4975do		
1800	1900		UK, BBC World Service	3255af	5790eu	
			5875eu	5950as	6190af	7405af
			9485as	11810af	12095af	13675eu
			15400af	17795af		
1800	1900	Sat	UK, Bible Voice Broadcasting	9430me		
1800	1900	Sun	UK, Bible Voice Broadcasting	6130eu		
1800	1900		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1800	1900		USA, EWTN/WEWN Vandiver AL	15610va		
1800	1900		USA, KJES Vado NM	15385pa		
1800	1900		USA, KJES Vado, NM	15385pa		
1800	1900		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
1800	1900		USA, WHRI Cypress Creek SC	9840na		
			9955na	11785na	17520af	
1800	1900	vl	USA, WINB Red Lion PA	13570ca		
1800	1900		USA, WJHR International Milton FL	15550usb		
1800	1900		USA, WRMI Miami FL	9955ca		
1800	1900		USA, WTJC Newport NC	9370na		
1800	1900		USA, WTWW Lebanon TN	9479na		
1800	1900		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385na		
1800	1900		USA, WYFR/Family Radio Worldwide	6180af		
			7395af	9770af	13615na	13690na
			13750af	17795na	17845af	18980va
1800	1900		Yemen, Republic of Yemen Radio	9780me		
1800	1900		Zambia, 1 Africa Radio/CVC	4965af	13590af	
1805	1810	Sat	Croatia, Croatian Radio	6165eu		
1805	1815	mtwhf	Croatia, Croatian Radio	6165eu		
1830	1845		Rwanda, Radio Rwanda	6055do		
1830	1845	Sat	UK, Bible Voice Broadcasting	6130eu		
1830	1900		Serbia, International Radio of Serbia	6100eu		
1830	1900		Slovakia, Radio Slovakia International	5920eu		
			6055eu			
1830	1900		Turkey, Voice of Turkey	9785eu		
1830	1900		UK, BBC World Service	5875as	6005af	
			9410af			
1830	1900	f	UK, Bible Voice Broadcasting	9430me		
1830	1900		USA, Voice of America	4930af	6080af	
			9850af	12015af	15580af	
1830	1900	Sat	USA, WHRI Cypress Creek SC	11785na		
1836	1900		New Zealand, Radio NZ International	9615pa		
1836	1900	DRM	New Zealand, Radio NZ International	9890pa		
1845	1900	mtwhas	Albania, Radio Tirana	7520eu	13640na	
1845	1900	Sun	UK, Bible Voice Broadcasting	11830af		
1859	1900		Netherlands, R Netherlands Worldwide	7425af		
			11610af	11970af		

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

1900	1915	Sun	UK, Bible Voice Broadcasting	11830af		
1900	1930		Germany, Deutsche Welle	6150af	11795af	
			17865af			

1900	1930		Turkey, Voice of Turkey	9785eu		
1900	1930		USA, Voice of America	4930af	4940af	
			6080af	9850af	15580af	17895af
1900	1930		Vietnam, Voice of Vietnam	7280eu	9730eu	
1900	1935	DRM	New Zealand, Radio NZ International	9890pa		
1900	1945	DRM	India, All India Radio	9950eu		
1900	1945		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1900	1945		USA, WYFR/Family Radio Worldwide	6085ca		
1900	1950		New Zealand, Radio NZ International	9615pa		
1900	1957		Netherlands, R Netherlands Worldwide	7425af		
			12045af	15535af		
1900	1957		North Korea, Voice of Korea	7100eu	9975af	
			11535va	11910af		
1900	2000		Anguilla, Worldwide Univ Network	11775am		
1900	2000		Australia, ABC NT Alice Springs	2310do		
1900	2000		Australia, ABC NT Katherine	2485do		
1900	2000		Australia, Radio Australia	6080pa	7240pa	
			9500as	9510pa	9710pa	11880pa
1900	2000		Bahrain, Radio Bahrain	6010me		
1900	2000	DRM	Belgium, TDP Radio	15755na		
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St John's NF	6160na		
1900	2000		Canada, CKZU Vancouver BC	6160na		
1900	2000		China, China Radio International	7295af		
			9435af			
1900	2000		Egypt, Radio Cairo	11510af		
1900	2000		Equatorial Guinea, Radio Africa	7190af		
			15190af			
1900	2000	DRM	Germany, Deutsche Welle	3995eu	5875eu	
1900	2000		Kuwait, Radio Kuwait	15540va	17550va	
1900	2000		Liberia, Star Radio	4025af		
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		Netherlands, R Netherlands Worldwide	11610af		
			11970af			
1900	2000		Nigeria, Voice of Nigeria/External Service			
			9690af	7255al		
1900	2000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1900	2000		Russia, Voice of Russia	12040eu		
1900	2000	mtwhf	Spain, Radio Exterior de Espana	9665af		
			11620eu			
1900	2000		Swaziland, TWR Africa	3200af		
1900	2000		Thailand, Radio Thailand World Service	7570eu		
1900	2000		Uganda, Radio Uganda	4975do		
1900	2000		UK, BBC World Service	3255af	3995eu	
			5875eu	5950as	6005af	6155as
			6190af	9410af	11810af	12095af
			15400af	17795af		
1900	2000		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1900	2000		USA, EWTN/WEWN Vandiver AL	15610va		
1900	2000		USA, Voice of America/Special English	7485va		
			9630va			
1900	2000		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
1900	2000		USA, WHRI Cypress Creek SC	9840na		
			11785na	15665af		
1900	2000	vl	USA, WINB Red Lion PA	13570ca		
1900	2000		USA, WJHR International Milton FL	15550usb		
1900	2000		USA, WRMI Miami FL	9955ca		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WTWW Lebanon TN	9479na		
1900	2000		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385na		
1900	2000		USA, WYFR/Family Radio Worldwide	3230af		
			7395af	9610af	9775af	13615af
			13690na	17795na	17845af	18930eu
			18980va			
1900	2000		Zambia, 1 Africa Radio/CVC	4965af	5940af	
1905	1920	Sat	Mali, ORTM Du Mali	5995do		
1905	2000	m	South Africa, Amateur Radio Mirror Intl	3215af		
1930	2000	Sat/Sun	Germany, Pan American Broadcasting	6175af		
1930	2000		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
1930	2000	vl	South Africa, RTE Radio Worldwide	6225af		
1930	2000		USA, Voice of America	4930af	4940af	
			6080af	9850af	15580af	
1936	2000	DRM	New Zealand, Radio NZ International	11675pa		
1945	2000	DRM	Vatican City State, Vatican Radio	9800am		
1950	2000		Vatican City State, Vatican Radio	4005eu		
			5885eu	7250eu	9645eu	
1951	2000		New Zealand, Radio NZ International	11725pa		

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

2000	2005	m	South Africa, Amateur Radio Mirror Intl	3215af		
2000	2015	Sun	Germany, Pan American Broadcasting	6175af		
2000	2020		Vatican City State, Vatican Radio	4005eu		
			5885eu	7250eu	9645eu	
2000	2027		Czech Republic, Radio Prague	5930eu		
2000	2027		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu	13640na	
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030	Sat	Germany, Pan American Broadcasting	6175af		
2000	2030	vl	South Africa, RTE Radio Worldwide	6225af		
2000	2030		Swaziland, TWR Africa	3200af		
2000	2030		USA, Voice of America	4930af	4940af	
			6080af	15580af		
2000	2030	DRM	Vatican City State, Vatican Radio	9800am		
2000	2030		Vatican City State, Vatican Radio	7365af		
			9755af	11625af		
2000	2045	h	Rwanda, Radio Rwanda	6055do		
2000	2045		USA, WYFR/Family Radio Worldwide	17750eu		
2000	2050	DRM	New Zealand, Radio NZ International	11675pa		
2000	2056		Romania, Radio Romania International	9690na		
			11880eu	11940na		
2000	2057		Germany, Deutsche Welle	6150af	11795af	
			11865af			
2000	2057		Netherlands, R Netherlands Worldwide	7425af		
			11610af	11970af		
2000	2059		Canada, Radio Canada International	15235af		
			17735af			
2000	2100		Anguilla, Worldwide Univ Network	11775am		
2000	2100		Australia, ABC NT Alice Springs	2310do		
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek	2325do		
2000	2100		Australia, Radio Australia	6080pa	11650pa	
			11660pa	11880pa		
2000	2100	Sat/Sun	Australia, Radio Australia	6080pa	7240pa	
			12080pa			
2000	2100		Bahrain, Radio Bahrain	6010me		
2000	2100		Belarus, Radio Belarus	7255eu	7360eu	
			7390eu			
2000	2100	DRM	Belgium, TDP Radio/Disco Palace	15755na		
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St John's NF	6160na		
2000	2100		Canada, CKZU Vancouver BC	6160na		
2000	2100		China, China Radio International	5960eu		
			5985af	7285eu	7295af	7415eu
			9440af	9600eu		
2000	2100		Equatorial Guinea, Radio Africa	7190af		
			15190af			
2000	2100		Indonesia, Voice of Indonesia	9526va	11785al	
2000	2100		Kuwait, Radio Kuwait	15540va	17550va	
2000	2100		Liberia, Star Radio	4025af		
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		New Zealand, Radio NZ International	11725pa		
2000	2100		Nigeria, Voice of Nigeria/External Service			
			15120af			
2000	2100		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2000	2100		Uganda, Radio Uganda	4975do		
2000	2100		UK, BBC World Service	3255af	5875eu	
			6005af	6190af	9410af	11810af
			12095af	13820af	15400af	
2000	2100		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2000	2100		USA, EWTN/WEWN Vandiver AL	15610va		
2000	2100		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
2000	2100		USA, WHRI Cypress Creek SC	11785na		
			13660eu	15665af		
2000	2100	vl	USA, WINB Red Lion PA	13570ca		
2000	2100		USA, WJHR International Milton FL	15550usb		
2000	2100		USA, WRMI Miami FL	9955ca		
2000	2100		USA, WTJC Newport NC	9370na		
2000	2100		USA, WTWW Lebanon TN	9479na		
2000	2100		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385na		
2000	2100		USA, WYFR/Family Radio Worldwide	7430eu		
			9610af	11690af	12055af	13615na
			17725sa	17795na	17845af	18980va
2000	2100		Zambia, 1 Africa Radio/CVC	4965af	5940af	
2000	2105		Uganda, Radio Uganda	4975do		
2030	2045		Thailand, Radio Thailand World Service	9680eu		
2030	2056	DRM	Romania, Radio Romania International	9765eu		
2030	2100		Cuba, Radio Havana Cuba	11760ca		

2030	2100		Sweden, Radio Sweden	9495va		
2030	2100		Turkey, Voice of Turkey	7205va		
2030	2100		USA, Voice of America	4930af	6080af	
			7355af	15580af		
2030	2100	fa	USA, Voice of America	4940af		
2030	2100		Vietnam, Voice of Vietnam	7280eu	9550me	
2045	2100		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2045	2100	DRM	India, All India Radio	9950eu		

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

2100	2130		Australia, ABC NT Alice Springs	2310do		
2100	2130		Australia, ABC NT Alice Springs	2310do		
2100	2130		Australia, ABC NT Katherine	2485do		
2100	2130		Australia, ABC NT Tennant Creek	2325do		
2100	2130		Austria, AWR Europe	11955af		
2100	2130	Sat	Canada, CBC NQ SW Service	9625na		
2100	2130		Cuba, Radio Havana Cuba	11760ca		
2100	2130		Serbia, International Radio of Serbia	6100eu		
2100	2130		South Korea, KBS World Radio	3955eu		
2100	2130		Turkey, Voice of Turkey	7205va		
2100	2145		USA, WYFR/Family Radio Worldwide	13615na		
			13690na	17795na	18980va	
2100	2150		New Zealand, Radio NZ International	11725pa		
2100	2150	DRM	New Zealand, Radio NZ International	11675pa		
2100	2157		Germany, Deutsche Welle	9735as	11865af	
			15640af			
2100	2157		North Korea, Voice of Korea	13760va	15245eu	
2100	2200		Angola, Radio Nacional de Angola	7217do		
2100	2200		Anguilla, Worldwide Univ Network	11775am		
2100	2200		Australia, Radio Australia	9500as	9660pa	
			11650pa	11660pa	11695as	12080pa
			13630pa	15515pa		
2100	2200		Bahrain, Radio Bahrain	6010me		
2100	2200		Belarus, Radio Belarus	7255eu	7360as	
			7390eu			
2100	2200		Bulgaria, Radio Bulgaria	5900eu	7400eu	
2100	2200		Canada, CFRX Toronto ON	6070na		
2100	2200		Canada, CFVP Calgary AB	6030na		
2100	2200		Canada, CKZN St John's NF	6160na		
2100	2200		Canada, CKZU Vancouver BC	6160na		
2100	2200	DRM	Canada, Radio Canada International	9800na		
2100	2200		China, China Radio International	5960eu		
			7205af	7285eu	7325af	7415eu
			9600eu			
2100	2200		Equatorial Guinea, Radio Africa	7190af		
			15190af			
2100	2200		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2100	2200	DRM	India, All India Radio	9950eu		
2100	2200		Malaysia, RTM/Traxx FM	7295do		
2100	2200		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2100	2200	Sat/Sun	Spain, Radio Exterior de Espana	9650eu		
2100	2200		Syria, Radio Damascus	9330eu	12085as	
2100	2200	DRM	UK, BBC World Service	3995eu		
2100	2200		UK, BBC World Service	3255af	3915as	
			5790eu	5875as	5905as	6005af
			6190af	6195as	7405af	9915af
			12095af			
2100	2200		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2100	2200		USA, EWTN/WEWN Vandiver AL	15610va		
2100	2200		USA, Voice of America	6080af	15580af	
2100	2200		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
2100	2200		USA, WHRI Cypress Creek SC	9690eu		
			11785na	13660eu		
2100	2200	vl	USA, WINB Red Lion PA	13570ca		
2100	2200		USA, WJHR International Milton FL	15550usb		
2100	2200		USA, WRMI Miami FL	9955ca		
2100	2200		USA, WTJC Newport NC	9370na		
2100	2200		USA, WTWW Lebanon TN	9479na		
2100	2200		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2100	2200		USA, WWRB Manchester TN	3215na	9385na	
2100	2200		USA, WYFR/Family Radio Worldwide	7425af		
			12055af	17845af		
2100	2200		Zambia, 1 Africa Radio/CVC	4965af	5940af	
2115	2145		Egypt, Radio Cairo	6270eu		
2130	2157		Czech Republic, Radio Prague	9410af		
2130	2200		Australia, ABC NT Alice Springs	4835do		
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200	mtwhfa	Canada, CBC NQ SW Service	9625na		
2130	2200		China, China Radio International	7365eu		
2130	2200		Guam, KSDA/ AWR	11850as		
2130	2200		Netherlands, R Netherlands Worldwide	7460af		
2130	2200		Sweden, Radio Sweden	7460va		

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

2200	2215		Angola, Radio Nacional de Angola	7217do		
2200	2230		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2200	2230	DRM	India, All India Radio	9950eu		
2200	2245		Egypt, Radio Cairo	6270eu		
2200	2245		USA, WYFR/Family Radio Worldwide	15770af		
2200	2256		Romania, Radio Romania International	5960as		
			7435va	9790eu	11940as	
2200	2300		Anguilla, Worldwide Univ Network	6090am		
2200	2300		Australia, ABC NT Alice Springs	4835do		
2200	2300		Australia, ABC NT Katherine	5025do		
2200	2300		Australia, Radio Australia	9660pa	11695as	
			11875as	12080pa	13630pa	15230pa
			15240as	15415as	15515pa	15560pa
2200	2300		Bahrain, Radio Bahrain	6010me		
2200	2300	smtwhf	Canada, CBC NQ SW Service	9625na		
2200	2300		Canada, CFRX Toronto ON	6070na		
2200	2300		Canada, CFVP Calgary AB	6030na		
2200	2300		Canada, CKZN St John's NF	6160na		
2200	2300		Canada, CKZU Vancouver BC	6160na		
2200	2300		China, China Radio International	9590as		
2200	2300		Equatorial Guinea, Radio Africa	7190af		
			15190af			
2200	2300		Malaysia, RTM/Traxx FM	7295do		
2200	2300		New Zealand, Radio NZ International	13730pa		
2200	2300	DRM	New Zealand, Radio NZ International	15720pa		
2200	2300		Russia, Voice of Russia	9890na		
2200	2300		Turkey, Voice of Turkey	9830va		
2200	2300		Uganda, Radio Uganda	4975do		
2200	2300		UK, BBC World Service	3915as	5905as	
			5935af	6195as	7490as	9440as
			9740as	9915af	12095af	
2200	2300	DRM	UK, BBC World Service	3995eu		
2200	2300		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2200	2300		USA, EWTN/WEWN Vandiver AL	11520va		
2200	2300	mtwhf	USA, Voice of America	5895va	7460va	
			7575va	11955va		
2200	2300		USA, WBCQ Monticello ME	5110usb	7415usb	
			9330am			
2200	2300		USA, WHRI Cypress Creek SC	9785af		
			11785na			
2200	2300	vl	USA, WINB Red Lion PA	9265ca		
2200	2300		USA, WJHR International Milton FL	15550usb		
2200	2300		USA, WRMI Miami FL	9955ca		
2200	2300		USA, WTJC Newport NC	9370na		
2200	2300		USA, WTWW Lebanon TN	9479na		
2200	2300		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2200	2300		USA, WWRB Manchester TN	3215na	9385va	
2200	2300		USA, WYFR/Family Radio Worldwide	5950na		
			11740na	15440na		
2200	2300		Zambia, 1 Africa Radio/CVC	4965af		
2215	2230		Croatia, Croatian Radio	3985eu	9925ca	
2230	2257		Czech Republic, Radio Prague	9440na		
2230	2300		China, Xizang PBS/Holy Tibet	4905do	4920do	
			5240do	6110do	6130do	6200do
			7255do	7385do		
2230	2300		Guam, KSDA/ AWR	15320as		
2230	2300		USA, Voice of America/Special English	9570va		
			11840va	15145va		
2245	2300		India, All India Radio	6055as	7305as	
			9705as	9705as	9950as	11645as
			13605as			

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

2300	0000		Anguilla, Worldwide Univ Network	6090am		
2300	0000		Australia, ABC NT Alice Springs	4835do		
2300	0000		Australia, ABC NT Katherine	5025do		
2300	0000		Australia, Radio Australia	9660pa	11875as	
			12080pa	13690pa	15560pa	17750as
2300	0000		Bahrain, Radio Bahrain	6010me		
2300	0000		Bulgaria, Radio Bulgaria	9700na	11700na	
2300	0000	smtwhf	Canada, CBC NQ SW Service	9625na		
2300	0000		Canada, CFRX Toronto ON	6070na		
2300	0000		Canada, CFVP Calgary AB	6030na		
2300	0000		Canada, CKZN St John's NF	6160na		
2300	0000		Canada, CKZU Vancouver BC	6160na		
2300	0000		China, China Radio International	5915as		
			5990ca	6145na	7350eu	7410as
			9610as	11690pa	11790as	11840na

2300	0000		Cuba, Radio Havana Cuba	5040na		
2300	0000		Egypt, Radio Cairo	11590na		
2300	0000	vl	Guyana, Voice of Guyana	3290va		
2300	0000		India, All India Radio	6055as	7305as	
			9705as	9705as	9950as	11645as
			13605as			
2300	0000		Malaysia, RTM/Traxx FM	7295do		
2300	0000		New Zealand, Radio NZ International		13730pa	
2300	0000	DRM	New Zealand, Radio NZ International		15720pa	
2300	0000		Russia, Voice of Russia	9890na		
2300	0000		UK, BBC World Service	3915as	6195as	
			7490as	9740as	9890as	11850as
			12010as			
2300	0000		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2300	0000		USA, EWTN/WEWN Vandiver AL		11520va	
2300	0000		USA, Voice of America	5895va	7575va	
			11955va			
2300	0000		USA, WBCQ Monticello ME	5110usb	7415usb	
			9330am			
2300	0000		USA, WHRI Cypress Creek SC		7315na	
2300	0000	Sat	USA, WHRI Cypress Creek SC		9690am	
2300	0000	smtwhf	USA, WHRI Cypress Creek SC		5920am	
2300	0000	vl	USA, WINB Red Lion PA	9265ca		
2300	0000		USA, WJHR International Milton FL		15550usb	
2300	0000		USA, WRMI Miami FL	9955ca		
2300	0000		USA, WTJC Newport NC	9370na		
2300	0000		USA, WTWW Lebanon TN	9479na		
2300	0000		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN	9385na	6890va	
2300	0000		USA, WYFR/Family Radio Worldwide		5950na	
			11580sa	15655sa	15440na	
2300	0000		Zambia, 1 Africa Radio/CVC	4965af		
2300	2330		Australia, Radio Australia	11695as	15240as	
			17795pa			
2300	2330		USA, Voice of America/Special English		9570as	
			13805va	15145va		
2300	2330	DRM	Vatican City State, Vatican Radio		9755am	
2300	2345		USA, WYFR/Family Radio Worldwide		11740na	
2330	0000		UK, BBC World Service	9580as		
2330	0000		USA, Voice of America/Special English		7460as	
			9570va	13805va	15145va	15340va
2330	0000		Vietnam, Voice of Vietnam	9840as	12020as	

MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana .....**http://rtsh.sil.at/**
Angola, Radio Nacional de Angola.....**www.rna.ao/**
Anguilla, Worldwide Univ Network .....**www.worldwideuniversitynetwork.com/**
Argentina, Radio Nacional RAE.....**www.radionacional.com.ar/**
Australia, ABC NT Alice Springs.....**www.abc.net.au/radio/**
Australia, ABC NT Katherine.....**www.abc.net.au/radio/**
Australia, ABC NT Tennant Creek .....**www.abc.net.au/radio/**
Australia, HCJB Global Voice Australia.....**www.hcjb.org/**
Australia, Radio Australia .....**www.abc.net.au/ra/**
Austria, AWR Europe **www.awr2.org/**
Bahrain, Radio Bahrain .....**www.radiobahrain.fm/**
Bangladesh, Bangladesh Betar .....**www.betar.org.bd/**
Belarus, Radio Belarus .....**www.radiobelarus.tvr.by/eng/**
Belgium, TDP Radio .....**www.airtime.be/schedule.html**
Belgium, TDP Radio/Disco Palace .....**www.airtime.be/schedule.html**
Bhutan, Bhutan Broadcasting Service .....**www.bbs.com.bt/**
Bulgaria, Radio Bulgaria .....**www.bnr.bg/**
Canada, CBC NQ SW Service.....**www.cbc.ca/north/**
Canada, CFRX Toronto ON .....**www.cfrb.com**
Canada, CFVP Calgary AB.....**www.classiccountryam1060.com**
Canada, CKZN St John's NF .....**www.cbc.ca/listen/index.html**
Canada, CKZU Vancouver BC.....**www.cbc.ca/bc**
Canada, Radio Canada International .....**www.rcinet.ca/**
China, China Radio International .....**www.cri.cn/**
China, Voice of the Strait.....**www.vos.com.cn**
Clandestine, Cotton Tree News.....**www.cottontreenews.org/**
Clandestine, Sudan Radio Service/ SRS ....**www.sudanradio.org/**
Croatia, Croatian Radio .....**www.hrt.hr/**
Cuba, Radio Havana Cuba .....**www.radiohc.cu/**
Czech Republic, Radio Prague .....**www.radio.cz/**
Egypt, Radio Cairo.....**www.sis.gov.eg/**
Ethiopia, Radio Ethiopia/External Service..**www.erta.gov.et**
France, Radio France Internationale.....**http://rfienglish.com**
Germany, AWR Europe.....**www.awr2.org/**
Germany, Blue Star Radio .....**www.mvbalticradio.de**
Germany, Deutsche Welle .....**www.dw-world.de/**
Germany, European Music Radio.....**www.emr.org.uk/**
Germany, Pan American Broadcasting .....**www.radiopanam.com/**
Germany, Radio Gloria International .....**www.radiopanam.com/**
Germany, TWR Europe.....**www.twr.org**
Greece, Voice of Greece .....**www.voiceofgreece.gr/**
Greece, Voice of Greece/Radio Filia.....**www.voiceofgreece.gr/**
Guam, KSDA/ AWR **www.awr2.org/**
Guam, KTWR/TWR.....**www.twr.org/**
Guyana, Voice of Guyana .....**www.voiceofguyana.com/**
India, All India Radio .....**www.allindiaradio.org/**
Indonesia, Voice of Indonesia .....**www.voi.co.id**
Iran, VOIRI/IRIB .....**www.irib.ir/English/**
Japan, NHK World/ Radio Japan.....**www.nhk.or.jp/english/**
Kuwait, Radio Kuwait.....**www.media.gov.kw/**
Laos, Lao National Radio .....**www.lnr.org.la**
Liberia, Star Radio .....**www.starradio.org.lr/**
Libya, LJB/Voice of Africa .....**www.voiceofafrica.com.ly**
Malaysia, RTM/Traxx FM.....**www.traxxfm.net/index.php**
Malaysia, RTM/Voice of Malaysia.....**www.rtm.gov.my**
Mali, ORTM Du Mali .....**www.ortm.ml**
Monaco, TWR Europe .....**www.twr.org/**
Mongolia, Voice of Mongolia.....**www.mnb.mn**
Nepal, Radio Nepal .....**www.radionepal.org/**
Netherlands, R Netherlands Worldwide ....**www.radionepal.org/**
New Zealand, Radio NZ International .....**www.rnzi.com**
Nigeria, Voice of Nigeria/External Service **www.voiceofnigeria.org**
Oman, Radio Oman.....**www.oman-tv.gov.om**
Pakistan, PBC/ Radio Pakistan.....**www.radio.gov.pk**
Palau, T8WH/WHRI/Sound of Hope Radio**www.whr.org/**
Philippines, FEBC .....**www.febc.ph**
Philippines, PBS/ Radyo Pilipinas.....**www.pbs.gov.ph/**
Poland, Polskie Radio Warsaw .....**www.polskieradio.pl**
Romania, Radio Romania International ....**www.rri.ro/**
Russia, Voice of Russia .....**www.ruvr.ru/**
Rwanda, Radio Rwanda .....**www.orinfor.gov.rw/radiorwanda.eng.html**
Saudi Arabia, BSKSA/Saudi Radio.....**www.saudiradio.net/**
Serbia, International Radio of Serbia.....**www.glassrbije.org**
Slovakia, IRRS/Euro Gospel Radio.....**www.nexus.org**
Slovakia, IRRS/Radio City .....**www.nexus.org**
Slovakia, IRRS/Radio Joystick .....**www.nexus.org**
Slovakia, Radio Slovakia International.....**www.rsi.sk**
South Africa, Amateur Radio Mirror Intl ....**www.sarl.org.za**
South Africa, AWR.....**www.awr2.org/**
South Africa, Channel Africa.....**www.channelafrica.org**
South Africa, RTE Radio Worldwide **www.rte.ie/radio1/**
South Africa, TWR Africa.....**www.twr.org/**
South Korea, KBS World Radio .....**http://rki.kbs.co.kr/english/**
Spain, Radio Exterior de Espana .....**www.ree.rne.es/**
Sri Lanka, SLBC .....**www.slbc.lk**
Swaziland, TWR Africa .....**www.twrafrica.org**
Sweden, Radio Sweden .....**www.sr.se/rs/english/**
Syria, Radio Damascus.....**www.rtv.gov.sy/**
Taiwan, Radio Taiwan International .....**http://english.rti.org.tw/**
Thailand, Radio Thailand World Service ...**www.hsk9.com/**
Turkey, Voice of Turkey.....**www.trt.net.tr**
Uganda, Dunamis Shortwave .....**www.biblevoice.org/stations/east-africa**
Uganda, Radio Uganda .....**www.ubconline.co.ug**
UK, BBC World Service.....**www.bbc.co.uk/worldservice/**
UK, Bible Voice Broadcasting.....**www.biblevoice.org/**
United Arab Emirates, FEBA Radio .....**www.febaradio.info**
United States, Overcomer Ministries.....**www.overcomerministry.org/**
USA, American Forces Network .....**http://myafn.dodmedia.osd.mil/**
USA, EWTN/WEWN Vandiver AL .....**www.ewtn.com**
USA, KNLS Anchor Point AK.....**www.knls.org/**
USA, Voice of America .....**www.voanews.com/**
USA, Voice of America/Special English.....**www.voanews.com/**
USA, Voice of America/Studio 7.....**www.voanews.com/**
USA, WBCQ Monticello ME.....**www.wbcq.com/**
USA, WHRI Cypress Creek SC .....**www.whr.org/**
USA, WINB Red Lion PA .....**www.winb.com/**
USA, WJHR International Milton FL .....
USA, WRMI Miami FL.....**www.wrmi.net/**
USA, WRNO New Orleans LA .....**www.wrnoworldwide.org/**
USA, WTJC Newport NC.....**www.fbnradio.com/**
USA, WTWW Lebanon TN.....**www.wtww.us**
USA, WWCR Nashville TN.....**www.wwcr.com**
USA, WWRB Manchester TN.....**www.wwrb.org/**
USA, WYFR/Family Radio Worldwide .....**www.familyradio.com/**
Vatican City State, Vatican Radio.....**www.vaticanradio.org**
Vatican City State, Vatican Radio/Mass.....**www.vaticanradio.org**
Vietnam, Voice of Vietnam.....**www.vov.org.vn**
Yemen, Republic of Yemen Radio .....**www.yemenradio.net**
Zambia, 1 Africa Radio/CVC.....**www.1africa.tv**

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

Nothing but QSLs

Basketball fans call it *nothing but net*, the act of swishing the basketball straight into the net. This month we present *nothing but QSLs* to close out the summer QSLing season.

CANADA

KBS World Radio, 9650 relay via Sackville, 9650 kHz. Full data *Visit Korea* card with site notation, unsigned. Schedule, calendar and KBS stickers enclosed. Received in 38 days for English report and $1.00US. Station address: International Broadcasting, Korean Broadcasting System, 18 Yeouido-dong, Yeondeungpo-gu, Seoul 150-790, Republic of Korea or to *english@kbs.co.kr* (Frank Hillton, Charleston, SC).
Streaming audio **www.kbs.co.kr**

Voice of Vietnam relay via Sackville, 6175 kHz. Full data rice paddies scenery card signed by Vñ Hái, Director of VOV World, plus pen, pennant and A10 schedule. Received in 38 days for an English report and two IRCs. Station address: 58 Quan Su Street, Hanoi, Vietnam. Verification address: 45 Ba Trieu, Hanoi, Vietnam (William R Wilkins, Springfield, MO/Rafael Rodriguez, Colombia). Website: **www.vov.org.vn**

CLANDESTINE

Radio Dabanga, 5915 kHz. No data red card with boy and radio, unsigned. Personal note from Anna Haalomor enclosed. Received in three weeks for email report to *radiodabanga@yahoo.com* (Wendel Craighead, Kansas). QSL address: Press Now, Witte Kruislaan 55, 1217 AM Hilversum, Netherlands. On-demand audio at: **www.radiodabanga.org**

CUBA

Radio Habana Cuba, 6000/6060 kHz. Two full data QSLs unsigned, plus calendars and bookmark. Received in 58 days for English report and souvenir postcard. Station address: Apartado 6240, La Habana, Cuba. (Duane Hadley, Bristol, TN) Streaming audio **www.radiohc.cu**

FRANCE

Bible Voice Broadcasting via Issoudun, 9730 kHz. *Reaching Nations* multicolored card and schedule. Received in 47 days for report to: P.O. Box 425, Station E, Toronto, Ontario Canada M6H 4E3 (Edward Kusalik, Alberta, Canada).
Streaming audio **www.biblevoice.org**

MEDIUM WAVE

CFAV 1570 kHz AM. *Radio Boomer*. Full data QSL card received in six days from *production@boomer1570.ca*. Report with one IRC mailed to: 2040 Autoroute Laval, Laval H7S2M9 Montreal, PQ Canada (Robert Pavanello, Italy/playdx).
Streaming audio **www.boomer1570.ca**

KSL 1160 kHz *Newsradio*. Full data QSL card signed by John Dehnel, Chief Engineer *jdehnel@ksl.com*, plus coverage map. Received in ten days for a medium wave report. Station address: KSL-Newsradio 1160 AM, 5 Triad Center, 55 North 3rd West, Salt Lake City, UT 84180-1109 UT USA ((Mauricio Molano, Spain/playdx). Streaming audio **www.ksl.com**

WBAP, 820 kHz AM. *News/Talk*. Full data verification letter signed by Neal Peden, Director of Engineering. Received in 112 days for a medium wave report. Station address: WBAP Talk 820, 2221 East Lamar Blvd., Suite 300, Arlington, TX 76006 USA (Mauricio Molano, Spain/playdx). Streaming audio **www.wbap.com**

Radio Actualitate 1593 kHz AM. Full data Radio Romania card and sticker. Received in 35 days for an AM report. Station address: 60-64 General Berthelot Street, RO-010165 Bucharest, Romania (Mauro Giroletti, Italy/playdx).

NIGERIA

Voice of Nigeria, 15120 kHz. No data card of *Zuma Rock* unsigned, plus station stickers. Received in 73 days for an English report and $2.00US. Station address: P.M.B. 40003, Ikoyi, Falomo, Lagos, Nigeria (Bruce Jensen, CA).
Streaming audio: **www.voiceofnigeria.org/**

NEW ZEALAND

Radio New Zealand, 11725 kHz. Full data *Voice of the Pacific* color radio/seashells card unsigned. Station info sheet, frequency schedule and sticker enclosed. Received to 45 days for $2.00US (Jensen). Station address: P.O. Box 123, Wellington, New Zealand. Streaming audio **www.rnzi.com**

PERU

Radio Victoria 6019 kHz. Spanish acknowledgement letter via email from Sr. Carlos Cabrera Torres. Received for Spanish report to postal address and $3.00US. Noted future reports may be sent to *radiovictoria@terra.com* Station address: Radio Victoria, via Iglesia Pentecoastal Dios es Amour, Av. Arica 248, Breña, Lima, Lima 05 Perú (Jensen). Website: **www.ipda.com.pe/**

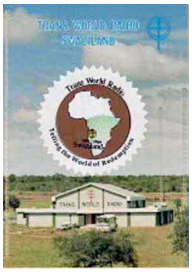
PIRATE

Euro: Free Radio Service Holland, 7685 kHz. Full data QSL card, letter and info sheet. Received in 30 days. Station address: Postbus 2702, NL-6049 ZG Herten, Netherlands (Norbert Reiner, Germany). FRS broadcast on an intermittent basis several times a year. Upcoming broadcast with streaming audio links and QSL information are posted at *Shortwave Central* blog at **http://mt-shortwave.blogspot.com/** FRS 7610 kHz. Full data *Just a Little Bit Different* e-QSL from Peter V in four days (Andrew Yoder, PA/Cumbre DX).

Euro: Radio Geronimo, 6265 kHz. Full data Native American Indians e-QSL card from Dave Scott. Received in a few hours for report to *geronimoshortwave@hotmail.com* (Yoder).

Euro: Radio Scotland International, 6305 kHz. Full data QSL card, letter and sticker. Received in five days for report to *radioscotland@hotmail.com* Station address: Postbus 85, NL-9410 AB Beilen, Netherlands (Reiner).

SLOVAKIA



Miyaya FM /IRRS/ NEXUS 7385/15670 kHz via Rimavska Sobota. Partial data IRRS La Scala card. Received in six weeks for report to: IRRS Shortwave, P.O. Box 10980, I-20110 Milano, Italy (Craighead). NEXUS website: **www.nexus.org**

SOUTH AFRICA

Radio Telefis Eireann/ RTÉ Radio Worldwide relay via Meyerton, 6225 kHz. Full data verification letter signed by Sikander Hoosen, HF Coverage Planning/ Ops & Maintenance, Sentech Pty. Received in 68 days for and an English report. Sentech address: Private Bag X06, Honeydew 2040, South Africa. (Kusalik) RTÉ streaming audio **www.rte.ie/radio/worldwide.html**

Voice of America relay via Meyerton, 11905 kHz. Full data card signed by Sikander Hoosen. Received in 68 days to Sentech address as above (Kusalik). VOA streaming audio **www.voanews.com**

SWAZILAND

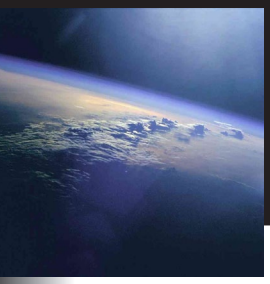
Trans World Radio 9500 kHz via Manzini. Full data TWR color scenery card with illegible signature. Program schedules and religious brochure enclosed. Received in 25 days for an English report and $1.00US. Station address: P.O. Box 1620, Kempton Park, Rep. of South Africa (Ben Clement, Portland, OR). Streaming audio **www.twrafrica.org/**

UTILITY

4X6TU, 14100 kHz, I.A.R.C. Propagation Beacon from the University of Tel Aviv. Full data yellow logo card via operator. Station address: P.O. Box 17600, Telk Aviv, 61176 Israel (Francesco Cecconi, Anagni, Italy/playdx).

GYA Northwood, Meteo FAX 12.390 MHz. Full data prepared QSL card verified and stamped with station seal. Received in nine days for a utility report. Station address: Fleet Operations, Commander in Chief, Northwoods, Middlesex HA6 3HP United Kingdom (Cecconi).

UHF Petropavlovak-Kamchatsky, 4217 kHz. Station operated by KCCM. Prepared QSL card confirmed, plus verification letter in Russian. Received in three months for a Russian utility report and $1.00US. Station address: Petropavlovsk Radio-UFH, Chief of Radiozentr, ul. Klyuchevskaya 38, Petropavlovsk 683003, Russia (Martin Foltz, CA/UDXF).



MTXtra
Shortwave Broadcast Guide

SPANISH

The following language schedule is extracted from our new *MTXtra Shortwave Broadcast Guide* pdf which is a free download to all *MTXpress* subscribers. This new online *Shortwave Broadcast Guide* has more than 9,100 station entries that include all languages being broadcasts via shortwave radio worldwide, sorted by time and updated monthly.

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

2200	2300		Argentina, Radio Nacional RAE			Spanish
			6060am	11710am		
2200	2300	mtwhf	Argentina, Radio Nacional RAE			Spanish
			11710am	15345eu		
2200	2300		Bolivia, Radio Causachun Coca			Spanish
			6075do			
2200	2300		Bolivia, Radio Cultural Juan XXIII			Spanish
			6055do			
2200	2300		Bolivia, Radio Estambul	Spanish	4498do	
2200	2300		Bolivia, Radio Fides	Spanish	6155do	
			9624do			
2200	2300		Bolivia, Radio Illimani/Radio Patria Nueva			Span-
			ish 6025do			
2200	2300		Bolivia, Radio Lipez	Spanish	4796do	
2200	2300		Bolivia, Radio Logos	Spanish	4865do	
			6165al			
2200	2300		Bolivia, Radio Loyola	Spanish	5996do	
2200	2300		Bolivia, Radio Mosoj Chaski	Spanish	3310do	
2200	2300		Bolivia, Radio Nacional de Huanuni			Spanish
			5967do			
2200	2300		Bolivia, Radio Pio XII	Spanish	5952do	
2200	2300		Bolivia, Radio San Gabriel	Spanish	6080do	
2200	2300		Bolivia, Radio San Jose	Spanish	5580do	
2200	2300		Bolivia, Radio San Miguel	Spanish	4699do	
2200	2300		Bolivia, Radio Santa Ana	Spanish	4451do	
2200	2300		Bolivia, Radio Santa Cruz	Spanish	6134do	
2200	2300		Bolivia, Radio Tacana	Spanish	4781do	
2200	2300		Bolivia, Radio Virgen de Remedios			Spanish
			4834do			
2200	2230		Bulgaria, Radio Bulgaria	Spanish	6200eu	
			9800eu			
2200	2259		Canada, Radio Canada International			Spanish
			11900sa	15455sa		
2200	2300		Chile, CVC La Voz Crista	Spanish	9635sa	
			17680sa			
2200	2300		China, China Radio International			Spanish
			7250eu	7335eu	9490eu	9640eu
			13700sa			
2200	2300		Colombia, La Voz de tu Conciencia			Spanish
			6010do	5910al		
2200	2300		Colombia, La Voz del Guaviare			Spanish
			6035do			
2200	2300		Colombia, Radio Marfil Estereo			Spanish
			5910do	6010al		
2200	2300		Cuba, Radio Havana Cuba	Spanish	5040va	
			6000na	6120ca	9640na	9660ca
			11730ca	12030ca	15120sa	15370eu
			15380sa			
2200	2300		Cuba, Radio Nacional de Venezuela			Spanish
			11670am			
2200	2300		Cuba, Radio Rebelde	Spanish	5025na	
2200	2300		Dominican Rep. R Amanecer Internacional			Span-
			ish 6025va			
2200	2300		Ecuador, HCJB Global	Spanish	6050sa	
2200	2255		Ecuador, La Voz del Napo	Spanish	3279do	
2200	2300		Ecuador, Radio El Buen Pastor	Spanish	4814do	
2200	2300		Ecuador, Radio Quito	Spanish	4919do	
2200	2300		Equatorial Guinea, Radio Bata			Spanish
			5005do			
2200	2300		Equatorial Guinea, Radio Malabo			Spanish
			6250do			
2200	2300		Guatemala, Radio Buenas Nuevas			Spanish
			4799do			
2200	2300		Honduras, HRMI/ Radio Misiones Intl			Spanish
			3340do			
2200	2300		Honduras, Radio Luz y Vida	Spanish	3250do	
2200	2300		Mexico, XEOI/Radio Mil	Spanish	6010do	
2200	2300		Mexico, XEQM/RASA Onda Corta			Spanish
			6104do			
2200	2300		Mexico, XERTA/Radio Transcontinental			Spanish
			4800do			
2200	2300		Mexico, XEXQ/Radio Universidad			Spanish
			6045do			
2200	2257		North Korea, Voice of Korea		Spanish	13760eu
			15245eu			
2200	2300		Peru, Radio Altura Spanish	5010do		
2200	2300		Peru, Radio Bethel Spanish	5921do		
2200	2300		Peru, Radio Bolivar	Spanish	5460do	
2200	2300		Peru, Radio Cultural Amauta	Spanish	4955do	
2200	2300		Peru, Radio Cusco Spanish	6195do		
2200	2300		Peru, Radio del Pacifico	Spanish	4974do	
2200	2300		Peru, Radio Huanta 2000	Spanish	4747do	
			4755al			
2200	2300	mtwhfa	Peru, Radio La Hora	Spanish	4857do	
2200	2300		Peru, Radio La Reyna de la Selva			Spanish
			5485do			
2200	2300	Sun	Peru, Radio La Voz de la Selva	Spanish	4824do	
2200	2300		Peru, Radio La Voz de las Huarinjas			Spanish
			5059do			
2200	2300		Peru, Radio Madre de Dios	Spanish	4950do	
2200	2300		Peru, Radio Manantial	Spanish	4991do	
2200	2300		Peru, Radio Melodia	Spanish	5940do	
2200	2300		Peru, Radio Ondas del Suroiente			Spanish
			5120do			
2200	2300		Peru, Radio Quillabamba	Spanish	5025do	
2200	2300		Peru, Radio Santa Rosa	Spanish	6047do	
2200	2300		Peru, Radio Sicuani	Spanish	4826do	
2200	2300		Peru, Radio Tarma Spanish	4775do		
2200	2300		Peru, Radio Tawantinsuyo	Spanish	6175do	
2200	2300		Peru, Radio Union Spanish	6114do		
2200	2300		Peru, Radio Victoria	Spanish	6020do	
			9720do			
2200	2300		Peru, Radio Vision Spanish	4790do		
2200	2300	Sat/Sun	Spain, Radio Exterior de Espana			Spanish
			9765ca	17850na		
2200	2300		Spain, Radio Exterior de Espana			Spanish
			7275eu	9570af	15110na	
2200	2300		Syria, Radio Damascus		Spanish	9330va
			12085sa			
2200	2300		Uruguay, Radio Sarandi		Spanish	6045do
2200	2300		USA, EWTN/WEWN Vandiver AL			Spanish
			12050ca	13820sa		
2200	2300		USA, KVOH Rancho Simi CA	Spanish	17775ca	
2200	2300		USA, Radio Marti Spanish	6030ca	9565ca	
			11930ca	13820ca		
2200	2300		USA, WYFR/Family Radio Worldwide			Spanish
			5985ca	6915sa	7520sa	9935sa
			11855ca	15130na	15255sa	
2200	2300		Venezuela, Radio Amazonas	Spanish	4940do	
2205	2300		Canada, Radio Canada International			Spanish
			6100sa			
2230	2300		Bolivia, Radio Eco Spanish	4409do		
2230	2300		Bolivia, Radio Yura	Spanish	4716do	
2230	2300		Peru, Radio Rasuwilca	Spanish	4805do	
2230	2300		Peru, Radio San Nicolas	Spanish	5470do	
2230	2300		Peru, Radio Super Sensacion	Spanish	6536do	

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

2300	0000	Sat/Sun	Argentina, Radio Nacional RAE			Spanish
			6060am	11710am		
2300	00000	mtwhf	Argentina, Radio Nacional RAE			Spanish
			11710am	15345eu		
2300	2330		Bolivia, Radio Causachun Coca			Spanish
			6075do			
2300	0000		Bolivia, Radio Cultural Juan XXIII			Spanish
			6055do			
2300	0000		Bolivia, Radio Eco Spanish	4409do		
2300	0000		Bolivia, Radio Estambul	Spanish	4498do	
2300	0000		Bolivia, Radio Fides	Spanish	6155do	
			9624do			
2300	0000		Bolivia, Radio Illimani/Radio Patria Nueva			Span-
			ish 6025do			

2300	0000		Bolivia, Radio Lipez	Spanish	4796do
2300	0000		Bolivia, Radio Logos 6165al	Spanish	4865do
2300	0000		Bolivia, Radio Loyola	Spanish	5996do
2300	0000		Bolivia, Radio Mosoj Chaski	Spanish	3310do
2300	0000		Bolivia, Radio Nacional de Huanuni 5967do	Spanish	
2300	0000		Bolivia, Radio Pio XII	Spanish	5952do
2300	0000		Bolivia, Radio San Gabriel	Spanish	6080do
2300	0000		Bolivia, Radio San Jose	Spanish	5580do
2300	0000		Bolivia, Radio San Miguel	Spanish	4700do
2300	0000		Bolivia, Radio Santa Ana	Spanish	4451do
2300	0000		Bolivia, Radio Santa Ana	Spanish	4451do
2300	0000		Bolivia, Radio Santa Cruz	Spanish	6134do
2300	0000		Bolivia, Radio Virgen de Remedios 4834do	Spanish	
2300	0000		Bolivia, Radio Yura	Spanish	4716do
2300	0000		Bulgaria, Radio Bulgaria 7400eu	Spanish	6200eu
2300	2359		Canada, Radio Canada International 11990sa 15455sa	Spanish	
2300	0000		Chile, CVC La Voz Crista 17680sa	Spanish	9635sa
2300	0000		China, China Radio International 6175eu 7210eu 7250eu 9590eu 9800eu	Spanish	
2300	0000		Clandestine, Radio Nacional De La R.A.S.D. Spanish 6300af		
2300	0000		Clandestine, Radio Republica	Spanish	9490ca
2300	0000		Colombia, La Voz de tu Conciencia 6010do 5910al	Spanish	
2300	0000		Colombia, La Voz del Guaviare 6035do	Spanish	
2300	0000		Colombia, Radio Marfil Estereo 5910do 6010al	Spanish	
2300	0000		Cuba, Radio Havana Cuba 6120ca 9592sa 9640na 11730ca 12020sa 12030ca	Spanish	6000na 9660ca
2300	0000		Cuba, Radio Nacional de Venezuela 13680am 15250am	Spanish	
2300	0000		Cuba, Radio Rebelde	Spanish	5025na
2300	2327		Czech Republic, Radio Prague 9440sa	Spanish	
2300	0000		Ecuador, HCJB Global	Spanish	6050sa
2300	0000		Ecuador, Radio El Buen Pastor	Spanish	4814do
2300	0000		Ecuador, Radio Quito	Spanish	4919do
2300	0000		Guatemala, Radio Buenas Nuevas 4799do	Spanish	
2300	0000		Honduras, HRMI/ Radio Misiones Intl 3340do	Spanish	
2300	0000		Honduras, Radio Luz y Vida	Spanish	3250do
2300	0000		Mexico, XEOI/Radio Mil	Spanish	6010do
2300	0000		Mexico, XEQM/RASA Onda Corta 6104do	Spanish	
2300	0000		Mexico, XERTA/Radio Transcontinental 4800do	Spanish	
2300	0000		Mexico, XEXQ/Radio Universidad 6045do	Spanish	
2300	0000		Peru, Radio Altura Spanish	5010do	
2300	0000		Peru, Radio Bethel Spanish	5921do	
2300	0000		Peru, Radio Bolivar	Spanish	5460do
2300	0000		Peru, Radio Cultural Amauta	Spanish	4955do
2300	0000		Peru, Radio Cusco Spanish	6195do	
2300	0000		Peru, Radio del Pacifico	Spanish	4974do
2300	0000		Peru, Radio Huanta 2000 4755al	Spanish	4747do
2300	0000	mtwhfa	Peru, Radio La Hora	Spanish	4857do
2300	0000		Peru, Radio La Reyna de la Selva 5485do	Spanish	
2300	0000		Peru, Radio La Voz De Bolivar	Spanish	5460do
2300	0000	Sun	Peru, Radio La Voz de la Selva	Spanish	4824do
2300	0000		Peru, Radio La Voz de las Huarinjas 5059do	Spanish	
2300	0000		Peru, Radio La Voz de las Huarinjas 5059do	Spanish	
2300	0000		Peru, Radio Madre de Dios	Spanish	4950do
2300	0000		Peru, Radio Manantial	Spanish	4991do
2300	0000		Peru, Radio Melodia	Spanish	5940do
2300	2330		Peru, Radio Ondas del Huallaga 3329do	Spanish	
2300	0000		Peru, Radio Ondas del Suroiente 5120do	Spanish	
2300	2330		Peru, Radio Ondas del Suroiente 5120do	Spanish	
2300	0000		Peru, Radio Quillabamba	Spanish	5025do
2300	0000		Peru, Radio Rasuwilca	Spanish	4805do
2300	0000		Peru, Radio San Nicolas	Spanish	5470do
2300	0000		Peru, Radio Santa Rosa	Spanish	6047do
2300	2300		Peru, Radio Sicuani	Spanish	4826do
2300	0000		Peru, Radio Super Sensacion	Spanish	6536do
2300	0000		Peru, Radio Tarma	Spanish	4775do
2300	0000		Peru, Radio Tawantinsuyo	Spanish	6175do
2300	0000		Peru, Radio Tawantinsuyo	Spanish	6175do
2300	0000		Peru, Radio Union	Spanish	6114do
2300	0000		Peru, Radio Victoria 9720do	Spanish	6020do
2300	0000		Peru, Radio Vision	Spanish	4790do
2300	2356		Romania, Radio Romania International 6100ca 9655ca 9745ca	Spanish	11955ca
2300	0000		Spain, Radio Exterior de Espana 9535ca 9620sa 11680sa	Spanish	15160sa
2300	0000		Taiwan, Radio Taiwan International 17725sa	Spanish	
2300	0000		Uruguay, Radio Sarandi	Spanish	6045do
2300	0000		USA, EWTN/WEWN Vandiver AL 12050ca 13820sa	Spanish	
2300	0000		USA, KVOH Rancho Simi CA	Spanish	17775ca
2300	0000		USA, Radio Marti 11775ca 11930ca	Spanish	6030ca 9565as
2300	0000		USA, Voice of America 9885ca 11625ca	Spanish	5890ca
2300	0000		USA, WYFR/Family Radio Worldwide 5985ca 6915sa 9935sa 11855ca	Spanish	11530sa
2300	2345		USA, WYFR/Family Radio Worldwide 15130na	Spanish	
2300	0000		Venezuela, Radio Amazonas	Spanish	4940do
2359	0000		Netherlands, R Netherlands Worldwide 6165sa 7325va	Spanish	

MT French Language Shortwave Broadcast Guide Aug 2010

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

0000	0100		Cuba, Radio Havana Cuba	French	5040sa
0000	0100		USA, WYFR/Family Radio Worldwide 15255sa	French	
0015	0030	mtwhf	Moldova, (Transnistria) Radio PMR 9665eu	French	

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

0100	0200		Bulgaria, Radio Bulgaria 11700na	French	9700na
0100	0115	mtwhf	Moldova, (Transnistria) Radio PMR 9665eu	French	
0100	0157		North Korea, Voice of Korea 15100as	French	13650as
0100	0156		Romania, Radio Romania International 7335na 9560eu	French	
0130	0200		Cuba, Radio Havana Cuba	French	5040sa
0145	0200	mtwhf	Moldova, (Transnistria) Radio PMR 9665eu	French	

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

0200	0230		Slovakia, Radio Slovakia International 5930na 9440sa	French	
0230	0250		Vatican City State, Vatican Radio 7305am 9610am	French	
0230	0300		Vatican City State, Vatican Radio 7360af	French	

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

0300	0400	twhfa	Argentina, Radio Nacional RAE 11710am	French	
0300	0357		North Korea, Voice of Korea 13760sa 15180sa	French	11735sa

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

0400	0500		France, Radio France Internationale 9790af 11700af	French	
0400	0500		South Africa, Hirondelle Foundation 11690af	French	
0430	0500		Austria, AWR Europe	French	6155af

0430	0500		UK, BBC World Service	French	6035af
			7380af	17885af	
0430	0500		Vatican City State, Vatican Radio		French
			9660af	11625af	
0440	0500		Vatican City State, Vatican Radio		French
			4005eu	5965eu	7250eu

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

0500	0600		France, Radio France Internationale		French
			9745af	9790af	11605af 11700af
0500	0600		Gabon, Africa No. 1	French	9580af
0500	0526	DRM	Romania, Radio Romania International		French
			7215eu		
0500	0526		Romania, Radio Romania International		French
			9450va	9655va	11790va
0500	0600		USA, WYFR/Family Radio Worldwide		French
			111530af	11580va	
0530	0600		Japan, NHK World/ Radio Japan		French
			9850af	13840af	
0530	0600		Laos, Lao National Radio	French	7145as
0530	0600	mtwhf	USA, Voice of America	French	4960af
			6035af	6095af	9880af 13710af

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

0600	0630		Bulgaria, Radio Bulgaria	French	9600eu
0600	0700		China, China Radio International		French
			17865eu		
0600	0627		Czech Republic, Radio Prague		French
			5930eu		
0600	0700		France, Radio France Internationale		French
			9745af	9790af	11605af 11700af
			15300af		
0600	0700		Gabon, Africa No. 1	French	9580af
0600	0630		UK, BBC World Service	French	6105af
			7375af	13820af	15430af
0600	0630	mtwhf	USA, Voice of America	French	4960af
			6035af	6095af	9880af 13710af
0600	0700		USA, WYFR/Family Radio Worldwide		French
			9355va	9385af	
0600	0630		Vatican City State, Vatican Radio		French
			11625af	13765eu	15570af
0615	0630	mtwhfa	Vatican City State, Vatican Radio		French
			4005eu	5965eu	7250eu 9645eu
			11740eu		
0615	0630	mtwhfa	Vatican City State, Vatican Radio		French
			15595va		
0630	0700		Iran, VOIRI/ IRIB	French	13750as 15430as

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

0700	0800		China, China Radio International		French
			17865eu		
0700	0800		France, Radio France Internationale		French
			11700af	13695af	15170af 15300af
0700	0800		Gabon, Africa No. 1	French	9580af
0700	0800		Greece, Voice of Greece	French	11645eu
0700	0730	Sat/Sun	Greece, Voice of Greece/Radio Filia		French
			11645eu		
0700	0727		Iran, VOIRI/ IRIB	French	13750as 15430as
0700	0800		Nigeria, Voice of Nigeria/External Service		
			French 15120af		
0700	0730		UK, BBC World Service	French	12095af
			17640af		
0730	0757		Czech Republic, Radio Prague		French
			11600va		

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

0800	0900		France, Radio France Internationale		French
			13695af	15300af	17620af 17850af
0800	0900		Gabon, Africa No. 1	French	9580af
0800	0830		Germany, AWR Europe	French	12010af
0800	0900		Saudi Arabia, BSKSA/Saudi Radio		French
			17785af		
0800	0845		USA, WYFR/Family Radio Worldwide		French
			11530af		

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

0900	1000		France, Radio France Internationale		French
			13695af	15300af	17620af 17850af
0900	1000		Gabon, Africa No. 1	French	9580af
0900	1000		Saudi Arabia, BSKSA/Saudi Radio		French
			17785af		

1000 UTC - 6AM EDT / 5AM CDT / 3AM PDT

1000	1100		France, Radio France Internationale		French
			15300af	17620af	
1000	1100		Gabon, Africa No. 1	French	9580af
1000	1056		Romania, Radio Romania International		French
			11830af	15240af	15380af 17785af
1000	1100		USA, WYFR/Family Radio Worldwide		French
			9625sa	11970sa	

1100 UTC - 7AM EDT / 6AM CDT / 4AM PDT

1100	1130		France, Radio France Internationale		French
			15300af	17620af	
1100	1200		Gabon, Africa No. 1	French	9580af
1100	1103	mtwhf	Monaco, Radio Monaco	French	4363 usb
			8728 usb	13146 usb	17260
			usb		
1100	1157		North Korea, Voice of Korea	French	11710sa
			11735sa	13650as	15180sa
1100	1110	mtwhfa	Vatican City State, Vatican Radio		French
			5965eu		

1200 UTC - 8AM EDT / 7AM CDT / 5AM PDT

1200	1300		China, China Radio International		French
			15205eu		
1200	1300		France, Radio France Internationale		French
			15300af	17620af	17660af 17850af
1200	1300		Gabon, Africa No. 1	French	9580af
1200	1257		Germany, Deutsche Welle	French	11795af
			13660af	21780af	
1200	1300		Germany, Deutsche Welle	French	15275af
			15410af		
1200	1230		UK, BBC World Service	French	15425af
			17780af	21630af	
1200	1300		USA, WYFR/Family Radio Worldwide		French
			13695na		
1200	1230		Vietnam, Voice of Vietnam/Overseas Service		
			French 7285as		
1230	1300		Japan, NHK World/ Radio Japan		French
			17690af		
1230	1300		Netherlands, R Netherlands Worldwide		French
			17690af		

1300 UTC - 9AM EDT / 8AM CDT / 6AM PDT

1300	1400		China, China Radio International		French
			13710eu	15205eu	
1300	1330		France, Radio France Internationale		French
			17850af		
1300	1400		France, Radio France Internationale		French
			15300af	17620af	
1300	1400		Gabon, Africa No. 1	French	9580af
1300	1330		Laos, Lao National Radio	French	7145as
1300	1400		USA, WYFR/Family Radio Worldwide		French
			11970sa		
1300	1330		Vietnam, Voice of Vietnam/Overseas Service		
			French 7285as		
1330	1357		Czech Republic, Radio Prague		French
			11600af		
1330	1400		France, Radio France Internationale		French
			13620af	13720af	

1400 UTC - 10AM EDT / 9AM CDT / 7AM PDT

1400	1430	h	Canada, Eglise du Christ	French	15245af
1400	1500		China, China Radio International		French
			11920eu	13670eu	
1400	1500		France, Radio France Internationale		French
			13620af	13720af	15300af 17620af
1400	1500		Gabon, Africa No. 1	French	9580af
1400	1457		North Korea, Voice of Korea	French	9335eu
			11710na	13760as	15245eu
1400	1500		Saudi Arabia, BSKSA/Saudi Radio		French
			17660af		
1440	1500	Sat	Swaziland, TWR Africa	French	9635af

1500 UTC - 11AM EDT / 10AM CDT / 8AM PDT

1500	1600	`	China, China Radio International		French	
			11920eu	13670eu		
1500	1600		France, Radio France Internationale		French	
			13620af	13720af	15300af	17620af
1500	1600		Gabon, Africa No. 1		French	9580af
1500	1600		Saudi Arabia, BSKSA/Saudi Radio			French
			17660af			
1500	1525	Sat	Swaziland, TWR Africa		French	9635af

1600 UTC - 12PM EDT / 11AM CDT / 9AM PDT

1600	1700		China, China Radio International			French
			11690eu			
1600	1700		Congo Republic, Radio Congo			French
			6115do			
1600	1700		France, Radio France Internationale			French
			13620af			
1600	1700		Gabon, Africa No. 1		French	9580af
1600	1657		Germany, Deutsche Welle		French	9440af
			11835af			
1600	1659		Germany, Deutsche Welle		French	15620af
			17840af			
1600	1657		Libya, LJB/Voice of Africa		French	15660af
			17725af			
1600	1657		North Korea, Voice of Korea		French	9335eu
			11710na	13760eu	15245eu	
1600	1656		Romania, Radio Romania International			French
			9680eu	11950eu		
1600	1700		Russia, Voice of Russia		French	9745af
			11550af			
1600	1700	DRM	Russia, Voice of Russia		French	9880af
1600	1700		Saudi Arabia, BSKSA/Saudi Radio			French
			17660af			
1600	1700		South Africa, Channel Africa		French	15235af
1600	1645		USA, WYFR/Family Radio Worldwide			French
			11910na			
1600	1615		Vatican City State, Vatican Radio			French
			4005eu	5885eu	7250eu	9645eu
			15595va			
1630	1657		Czech Republic, Radio Prague			French
			9740eu			
1630	1700		Vietnam, Voice of Vietnam/Overseas Service			
			French 7220me	9550me		

1700 UTC - 1PM EDT / 12PM CDT / 10AM PDT

1700	1730		Bulgaria, Radio Bulgaria		French	5900eu
			7400eu			
1700	1730	DRM	Bulgaria, Radio Bulgaria		French	9700eu
1700	1759	fs	Canada, Radio Canada International			French
			5850na			
1700	1800		Congo Republic, Radio Congo			French
			6115do			
1700	1800		Ethiopia, Radio Ethiopia/External Service			French
			7165va	9560va		
1700	1800		France, Radio France Internationale			French
			13695af	17620af	21690af	
1700	1800		Gabon, Africa No. 1		French	9580af
1700	1757		Germany, Deutsche Welle		French	17610af
			17840af			
1700	1800		Germany, Deutsche Welle		French	9735af
			11890af			
1700	1757		Libya, LJB/Voice of Africa		French	11995af
			15215af			
1700	1800		Russia, Voice of Russia		French	9745af
			11550af	15465af		
1700	1800		Saudi Arabia, BSKSA/Saudi Radio			French
			17660af			
1700	1730		Slovakia, Radio Slovakia International			French
			5920eu	6055eu		
1700	1745		USA, WYFR/Family Radio Worldwide			French
			17885af			
1700	1800		USA, WYFR/Family Radio Worldwide			French
			6225af			
1700	1730		Vatican City State, Vatican Radio			French
			13765af	15570af		
1705	1800		Canada, Radio Canada International			French
			9515na			
1705	1800	DRM	Canada, Radio Canada International			French
			9800na			
1715	1730	mtwhf	Moldova, (Transnistria) Radio PMR			French
			6240eu			
1730	1800	mtwhfa	Albania, Radio Tirana		French	7465eu

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

1800	1900		Canada, Radio Canada International			French
			9515na			
1800	1900	DRM	Canada, Radio Canada International			French
			9800na			
1800	1900		China, China Radio International			French
			5970eu	6055af	9480eu	11695eu
1800	1900		Congo Republic, Radio Congo			French
			6115do			
1800	1900		France, Radio France Internationale			French
			11705af	13695af	17620af	21690af
1800	1900		Gabon, Africa No. 1		French	9580af
1800	1815	mtwhf	Moldova, (Transnistria) Radio PMR			French
			6240eu			
1800	1857		North Korea, Voice of Korea		French	7210af
			9975af	11535va	11910af	
1800	1900		Russia, Voice of Russia		French	11550af
			12050af	15465af		
1800	1900	DRM	Russia, Voice of Russia		French	9880af
1800	1900	mtwhf	Spain, Radio Exterior de Espana			French
			9665eu			
1800	1830		UK, BBC World Service		French	5985af
			15105af	15180af	17660af	17885af
1800	1900		USA, WYFR/Family Radio Worldwide			French
			18930eu	21525af		
1830	1900		China, China Radio International			French
			7350af	9645af		
1830	1857		Czech Republic, Radio Prague			French
			5930eu			
1830	1845	th	Germany, Radio Reveil Paroles de Vie			French
			15675af			
1830	1900		Iran, VOIRI/ IRIB	French	5945va	9860va
			13600va	15085va		
1830	1845		UK, FEBA Radio	French	15250af	
1830	1900		USA, Voice of America		French	6080af
			6170af	9815af	17550af	
1830	1900		USA, WYFR/Family Radio Worldwide			French
			17585af			
1830	1900		Vietnam, Voice of Vietnam/Overseas Service			
			French 7280eu	9725eu	9730eu	
1845	1900	mtwhf	Moldova, (Transnistria) Radio PMR			French
			6240eu			

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

1900	1930	mtwhfa	Albania, Radio Tirana		French	7465eu
1900	1904		Canada, Radio Canada International			French
			9515na			
1900	1904	DRM	Canada, Radio Canada International			French
			9800na			
1900	1959		Canada, Radio Canada International			French
			11765af	13730af	15320af	17735af
1900	2000		China, China Radio International			French
			5970eu	6055af	7350af	9480eu
			9645af	11695eu		
1900	2000		Congo Republic, Radio Congo			French
			6115do			
1900	2000		France, Radio France Internationale			French
			9790af	11705af	13695af	17620af
			21690af			
1900	2000		Gabon, Africa No. 1		French	9580af
1900	1927		Iran, VOIRI/ IRIB	French	5945va	9860va
			13600va	15085va		
1900	2000		Russia, Voice of Russia		French	11550af
			12030af	12050af	15465af	
1900	2000	DRM	Russia, Voice of Russia		French	9880af
1900	2000		South Korea, KBS World Radio			French
			6145eu			
1900	2000	Sat	Spain, Radio Exterior de Espana			French
			9570af			
1900	2000	Sun	Spain, Radio Exterior de Espana			French
			12015me			
1900	2000		Syria, Radio Damascus		French	9330va

SKY SURFING

RADIO FROM THE OUTER REACHES

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Working Your First Amateur Radio Satellite (Part IV)

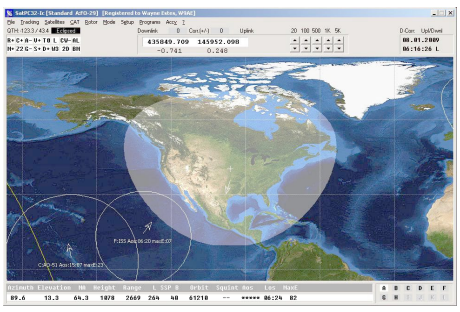
I trust you are enjoying this multi-part series of articles designed to take the mystery out of operating through amateur radio's current fleet of orbiting communications satellites. In this installment, I'll quickly review some of the more sophisticated satellite tracking software that's currently available. I'll also share some tips on choosing a base station radio and accessories specifically designed for satellite work, and then wrap up this "getting started" series with a final word on feed lines and connectors.

❖ Tracking Topix

As I said in the January, 2010 kickoff article to this series, in order to listen for (or communicate through) an amateur radio satellite, you first have to know when it will be in range of your station. Fortunately, most of us now have computers in our operating positions to assist us with this once rather arduous task.

Currently, organizations such as the Radio Amateur Satellite Corporation (AMSAT) now offer Internet-based satellite tracking information in graphic form via their website **(www.amsat.org/amsat-new/tools/predict/satloc.php).** You can even get quick pass predictions from AMSAT for a handful of the more popular satellites simply by entering your Maidenhead grid square (or your latitude and longitude) into the online prediction engine at **www.amsat.org/amsat-new/tools/predict/index.php.** However, if you are serious about satellite work, you'll eventually want to use something more permanent to run on your own home computer.

Over the years, PC-based tracking programs have become more sophisticated as the computing power available to run them has improved. Today, a number of them can track multiple satellites using highly sophisticated graphical interfaces. Some even send altitude and azimuth aiming data to your satellite antenna rotators for the ultimate in "hands off" tracking. A number of these programs can also automatically tune your radio to the proper uplink and downlink frequencies to compensate for Doppler shift as the satellite of interest whizzes overhead.



The SatPC32 tracking software package from AMSAT provides a graphic display of multiple satellites as well as a source to tune your radio for Doppler shift. It can also drive a rotator interface to automatically turn your satellite antennas. (Courtesy: AMSAT)

The AMSAT Web site hosts an extensive archive of various satellite-related software programs (including tracking programs) for various computer platforms at: **www.amsat.org/amsat-new/tools/softwareArchive.php#pc.**

For Windows 95/98/ME/NT/2000/XP/Vista/Windows 7 users, AMSAT also offers a superb tracking program called SATPC32. Written by Eric Eichmann, DK1TB, this program features automatic Keplerian Element download, voice announcements when satellites are in range, multiple world map projections with zoom capability, as well as support for a number of antenna rotator tracking interfaces.

For a small monetary donation to AMSAT, SATPC32 is currently available in either direct download or CD ROM format via the AMSAT website at: **www.amsat-na.com/store/item.php?id=100017.** You can also download a trial version of the latest release of SatPC32 from the author's web site at: **www.dk1tb.de/download-eng.htm**. However, this version requires you to re-enter your latitude and longitude every time you start the program. To fully activate your copy of SATPC32, you must obtain a registration code via the AMSAT online store or by calling the AMSAT office at 1-888-322-6728.

Tracking software for Macintosh users is also available from AMSAT for a small monetary donation. Their current offering is MacDoppler, which provides a number of levels of station automation, from assisted Doppler tuning and antenna pointing right on up to fully automated satellite gateway operation. More information on MacDoppler can be found at: **www.amsat-na.com/store/item.php?id=100164,** or, again, by calling the AMSAT office.

❖ Feeding your Tracking Program

Whichever tracking program you ultimately choose, it is important to always keep your Keplerian element file up-to-date. That's because gravitational interactions of the Sun, the Moon and the Earth on orbiting satellites (as well as the residual air they encounter where they operate) all conspire to slow them down just a tiny bit on every orbit. Over time, these orbital changes will directly affect when a particular satellite will be in range of your station.

In addition, the crew of the International Space Station (ISS) periodically fires the station's onboard thrusters to change its orbit. Usually, this is done so as to move the ISS out of the way of "space junk" or to boost its orbit to keep it in space. If you are tracking the ISS, this action, too, will directly affect when the ISS will be in range of your station.

Because satellite orbits change over time, most veteran satellite operators update their Keplerian Element files in their tracking programs once every few weeks or so. The AMSAT website **(www.amsat.org/amsat-new/tools/keps.php)** offers Keplerian Element files for free download in a number of formats, including the more verbose AMSAT format (for manual tracking) to what are called "NASA Two Line Elements" suitable for file capture and later upload into your tracking software.

❖ Base Station Radios

As I've said in previous columns, while hand-held radios and antennas are great for "hit or miss" satellite contacts, if you are serious about satellite work, eventually you'll want something more permanent for your home station.

Over the years, several amateur radio manufacturers have offered base station radios specifically equipped to work the satellites. This equipment usually offers all-mode VHF/UHF capability and can also transmit and receive in "full duplex" mode, meaning the radio has the ability to transmit signals on one band and simultaneously receive them on another. While not absolutely necessary, this feature makes it much easier to know if your signal is actually getting into (and through) the "bird." It also helps you tune your radio to compensate for Doppler shift as the satellite whizzes overhead.

A good place to start your search for a satellite-capable, full duplex base station radio is with a list compiled by Andrew Koenig, KE5GDB at**: www.thathamkid.com/website/ham-radio/full-duplex-radios**. While there are only a handful of new, full duplex radios on the market today, many older (but still perfectly functional) satellite-capable radios can still be found on the used market. Some time spent scouring the various amateur radio bulletin boards that offer used equipment (such as **www.qrz.com** or **www.eham.net**) may pay off in a somewhat older, but still perfectly functioning satellite radio at a fraction of the cost of a new one.

And while a single, "all in one," full duplex base station radio is nice to have, for many years I operated on the satellites using two separate radios. One was an all-mode VHF radio (a Kenwood TS-711A) and the other was an all-mode UHF radio (its 70 cm companion, the Kenwood TS-8llA). And while I had to manually tune each of them to keep up with "Dr. Doppler," this setup still provided me with many hours of solid satellite radio time.

The Kenwood TS-2000 is another all mode HF/VHF/UHF base station radio suitable for full duplex satellite work that is, as of this writing, still in production. (Courtesy: Kenwood USA)

Likewise, today, if a full duplex, all-in-one "box" is beyond your means, you can still adapt a number of the all-mode VHF/UHF-capable base or mobile radios now on the new (or used) market for satellite work. For example, many satellite operators have very successfully adapted a pair of all-mode Yaesu FT-817 (so-called QRP) radios (or its more powerful cousin the FT-857) for both FM and analog satellite work…one radio for the VHF/UHF uplink and one for the VHF/UHF downlink.

The Yaesu FT-847 is a 1990s-era, all-mode, HF/VHF/UHF base station radio that was specifically optimized for full duplex satellite work. While now out of production, it can sometimes still be found on the used market. (Courtesy: www.rigpix.com)

The ICOM IC-910H is a late model, all mode VHF/UHF base station that was specifically optimized for full duplex satellite work. This radio has recently been dropped from the ICOM lineup in favor of a newer satellite-capable model. However, Start looking for the '910H to show up on the used market. (Courtesy: www.rigpix.com)

❖ Preamps

As the downlink signal from these satellites is already weak when it strikes your antenna, another "nice to have" (but not absolutely necessary) addition to your base station setup is a receive preamplifier to boost the satellite's downlink signal. These preamplifiers (or "preamps" as we call them) come in many shapes and forms. Some are integrated into the radio itself (or into external, so-called "brick" amplifiers," while others are designed to be mast mounted nearer to your antenna.

Mast-mounted preamps, such as this one from SSB electronics, boost weak satellite downlink signals at the antenna feed point where those signals are strongest. (Courtesy: SSB Electronics)

Over the years, I've found the mast-mounted variety are best because they boost the satellite's weak downlink signal where it is strongest, that is, *before* any of that weak satellite downlink signal is lost in the feed line to your station. However, unless the preamp is specifically equipped with internal switching relays, it is *very* important to remember that transmitting a signal back through one of them will often prove fatal to the device. I've "smoked" more than one of these in my time this way!

❖ A Word about Connectors

While I have already discussed the importance of using a high quality, low loss feed line to and from your satellite antenna (and keeping that feed line length as short as practicable) it is also important to use the very best connectors you can afford. Just as with choosing your feed line, if you try to skimp on the connectors for the feed line connecting your antenna to your radio, you could loose a significant portion of your signal through those connectors as well.

Remember, every dB of attenuation that weak satellite signals encounter while traveling from your antenna to your radio is a bit of the downlink you won't hear. A 3-6 dB loss from using cheap, HF-only rated coax and poor quality connectors can turn a marginal VHF or UHF downlink signal into one that simply isn't there.

Connectors add to line losses by creating impedance "humps" that act like little resistors in the line. At HF (and to some extent at 6m and 2m) you can get by with using the common SO-239/PL-259 connector combination. However, at higher frequencies (such as at 70 cm and above where many of our amateur radio satellites operate) most satellite-capable equipment comes equipped with a Type-N connector. (See sidebar.) The type-N connector, when properly installed, will help minimize these small mismatches in the feed line which, in turn, will allow a greater portion of that already weak satellite downlink signal to make its way to your operating position from your satellite antenna. As I also noted in a previous column, it is critically important to make sure that these connectors are well seated and well sealed when installed at your antenna. Otherwise, your coax will very quickly become waterlogged and then you'll *really* have line losses to contend with! One popular method is to wrap electrical tape tightly around the connectors, or use one of the many available hand-moldable compounds sold just for this purpose.

A Type-N Connector for the Masses!

PL-259 connectors are usually easy to assemble and solder. However, if you are like me, working with N connectors has always been problematic. The typical Type-N connector consists of up to 6 components, all of which must be carefully seated and soldered to seal out moisture properly.

However, no matter how carefully I assembled and installed feed lines using the "old" Type-N connectors, I often found that (particularly in outdoor applications) the slightest pull on the coax usually resulted in a detached (or shorted!) N connector.

Thankfully, innovation has now come to the rescue! This **two-piece N connector** is a silver plated, gold tip connector of top quality that solders and assembles much like a PL-259. Yet, this version maintains most of the "bumpless" impedance qualities of the classic Type-N. Even the same UG175 and UG176 reducers for PL-259s can be used for smaller cable types.

Those of us who are "all thumbs" when it comes to working with coax connectors need never again struggle with a Type-N! A good source for this modern, PL-259-like version of the classic Type-N is Universal Radio in Reynoldsburg, Ohio. **(www.universal-radio.com/catalog/parts/nconn.html)**.

This two-piece, Type-N connector makes the age-old chore of working with N connectors a breeze. (Courtesy: Universal Radio)

❖ Wrap Up

I hope you have enjoyed this short series of "satellite primers," all designed to help get you started using our amateur radio satellites. But, now is *not* the time to stop your learning! The AMSAT web site **(www.amsat.org)** offers a wealth of practical, "hands on" information (either free or for a small monetary donation) to help fuel your growing interest in the "birds." What's more, because of the publications you receive when you join, a membership in your national, non-profit AMSAT organization is a good way to keep expanding your knowledge, while also helping ensure new amateur radio satellites will continue to be built and launched.

In future columns, I'll be exploring some of the features of our current fleet of satellites in orbit (including, if all goes as planned, one that is now being prepared for launch via the ISS), as well as some more information on how our amateur radio satellites and the AMSAT organization and its predecessors came to be. See you then.

MILCOM
MONITORING MILITARY COMMUNICATIONS

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Where to Monitor the Military

When most monitors think about monitoring the military, they normally associate military communications with the 225-400 MHz aeronautical band. And, while that 175 MHz of spectrum space holds a lot of listening opportunity, it is not the only place to monitor military communications.

❖ So where can I hear military communications?

This is a more common question from radio monitors than you might think. Old monitoring pros know where to concentrate their efforts, but often newcomers to the radio hobby struggle to hear their first military communications. Table One of this column provides the radio hobbyist some general search areas throughout the spectrum in which to find military communications.

In the shortwave spectrum, military communications can occur just about anywhere from 2 to 30 MHz. We have even heard them transmitting in the shortwave broadcast subbands from time to time. But if you want your best shot at hearing some high frequency (HF) military communications, the aeronautical off-route bands indicated in Table One offer the listener some concentrated frequency areas to search for military communication activity.

Most of the analog voice HF military communications utilize the upper sideband (USB) mode. So if you tune across the shortwave bands in USB, you'll catch the majority of the analog voice traffic that can be heard on HF. You will occasionally hear a few analog voice transmissions using the lower sideband (LSB) mode, but these are few and far between.

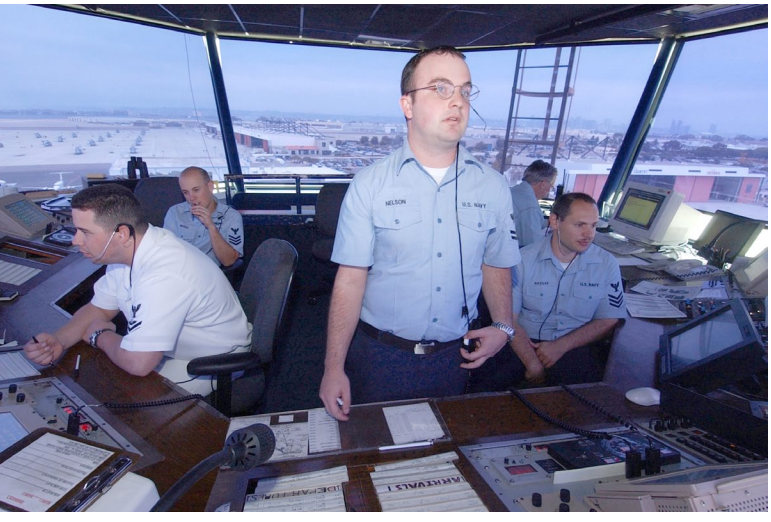
The predominant voice encryption mode you will hear on HF is ANDVT (Advanced Narrowband Digital Voice Terminal). ANDVT is the workhorse secure voice terminal for low bandwidths secure voice communications throughout U.S. Department of Defense (DoD).

ANDVT units are primarily used for tactical secure voice requirements on high frequency (HF), very high frequency (VHF), and ultra high frequency (UHF) satellite and line-of-sight (LOS) communications; UHF Non-Demand Assigned Multiple Access (Non-DAMA) and DAMA; super high frequency (SHF) and extremely high frequency (EHF) satellite communications (SATCOM) including Milstar; UHF Follow-on (UFO)/EHF; and the Fleet Satellite EHF Package (FEP).

Devices in the ANDVT family include the AN/USC-43 Tactical Terminal (TACTERM), the KY-99A Miniaturized Terminal (MINTERM), and the KY-100 Airborne Terminal (AIRTERM). ANDVT uses a 39-Tone HF Modem Coupled with the LPC-10 Vocoder for digital voice communications.

❖ The Digital Side of HF – ALE

Automatic Link Establishment, commonly known as ALE, is the worldwide *de facto* standard for digitally initiating and sustaining HF radio communications. ALE enables an HF communications radio transceiver system to make contact, or initiate a circuit, between itself and another HF radio station or network of stations. The purpose is to provide a reliable and rapid method of calling and connecting during constantly changing HF ionospheric propagation, reception interference, and shared spectrum use of busy or congested HF channels.



In a nutshell, an ALE radio system enables connection for voice conversation, alerting, data exchange, texting, instant messaging, email, file transfer, image, geo-position tracking, or telemetry. With a radio operator initiating a call, the process normally takes a few minutes for the ALE to pick an HF frequency that is optimum for both sides of the communication link. It signals the operators audibly and visually on both ends, so they can begin communicating with each other immediately.

In modern HF communications, ALE has largely replaced HF prediction charts, propagation beacons, chirp sounders, propagation prediction software, and traditional radio operators' educated guesswork.

As most *MT* readers are aware, the ALE mode can be monitored using free software and a computer with a soundcard. Monitoring ALE transmissions provides the listener with two advantages not available with conventional monitoring of analog voice signals:

First, we can use the ALE addresses to not only identify the user of a frequency, but all the possible participants in that network, even if most or all of the communications are encrypted or use a digital mode that cannot be decoded.

Second, as the monitoring process progresses, we can be led to additional frequencies used by the network of HF radio stations being observed. Using ALE listening techniques, military monitors worldwide have uncovered various networks from many different countries that might have gone unnoticed or undiscovered if it weren't for our ability to decode ALE transmissions.

So, if you don't live close to a military base, HF offers one of the few ways to hear a high volume of military communications in a short period of time. There are literally thousands of HF frequencies being used by military organizations all over the world. Protecting one's nation is a 24-hour a day operation, so there is never a shortage of military communications on HF.

❖ Monitoring VHF/UHF Military Communications

If you have a scanner, you can hear some of the most exciting military communications available in the radio spectrum on military frequencies. Again, Table One has an extensive listing of bands and modes to search for activity. A good omni-directional antenna, quality coax and scanning receiver will afford the monitor a lot of interesting military traffic.

However, you don't need to live near a

military base to hear military aircraft traffic. I live more than 90 miles from the nearest military base with aircraft, but I regularly hear air to ground communications from all sorts of US military aircraft that transit our area of rural North Carolina.

As I previously mentioned, there is more to military monitoring than just the 224-400 MHz spectrum. If you are near a military installation, the government/military land mobile radio bands can provide some of the best stuff you will ever hear on a scanner.

Like their civilian counterparts, the military has recently been migrating to more efficient use of the spectrum through the use of trunking technology. In fact, to open up even more spectrum to this use, DoD reorganized a portion of the 224-400 MHz spectrum to support new LMR narrowband digital trunk technology.

As we first reported in this column, DoD issued a new bandplan which created a new subband in the 380-400 MHz frequency range back in 2004. The fun part of this for monitors is that we are making new discoveries in this subband almost daily. Over the last six years we've been finding new systems (both trunked and conventional), old nationwide standard frequencies moving to new frequencies, and previously aero-only frequencies put to new usage in the 380-400 MHz subband.

Any time I am on the road, no matter where, the first radio activity I will usually conduct is a search from 380 to 400 MHz using 12.5 kHz. Keep in mind that all the LMR activity in this new subband uses the digital voice technology, so you will need a digital capable scanner to monitor non-aero voice communications here.

There are a few frequencies that I always program in my scanner and recommend to my scanner friends. Here is my list of nationwide military frequency assignments:

Air Defense Operations
139.7000 (AM)

Air Operations
138.1500 138.2500 138.4375 138.5500
138.6000 138.6250 138.7500 138.9500
139.0000 139.1125 139.6000 139.8000
139.9000 140.2000 140.3000 140.5000
141.1500 141.1750 141.2500 141.3000
141.4000 141.5500 141.6000 141.6500
141.9500 142.1125 142.2250 142.6000
142.7000 142.8000 142.9000 142.9625
143.0000 143.1500 143.6000 150.1500
150.2500 150.3000 (AM)

Civil Air Patrol (CAP)
139.8750 141.0000 141.5750 143.5500
143.6000 143.6250 143.7000 148.1250
148.1375 148.1500 149.2750 150.2250
150.5625 (Narrowband FM/P25)

Coast Guard Auxiliary
138.4750 142.8250 143.4750 149.2000
150.7000 (Narrowband FM)

DoD VHF Trunk Radio Systems
138.0125 138.0375 138.0625 138.0875
138.1125 138.1375 138.1625 138.1875
138.2125 138.2375 138.2625 138.3125
138.3375 138.3635 138.3875 138.4125
138.5125 138.5375 138.5625 138.5875
138.6125 138.6375 138.6875 138.7125
138.7375 139.0375 139.1875 139.3375
139.4875 139.6375 139.7625 139.7875
139.9375 140.6625 142.3375 143.0875
143.3375 143.3625 143.5375 143.6375
143.6875 143.7125 143.7375 150.1125

FEMA
141.3750/150.3750 138.6625/143.8875
138.4000/142.1625 138.8875/142.7625
141.0875/149.0250 142.0500/149.8375
138.9375/143.2250 (Narrowband FM/P25)

Inter-Squad Radios
396.8750 <Channel 1> 397.1250 <Channel 2> 397.1750 <Channel 3> 397.3750 <Channel 4> 397.4250 <Channel 5> 397.4750 <Channel 6> 397.5500 <Channel 7> 397.9500 <Channel 8> 398.0500 <Channel 9> 399.4250 <Channel 10> 399.4750 <Channel 11> 399.7250 <Channel 12> 399.9250 (Narrowband FM)

Military Auxiliary Radio System (MARS)
138.9750 139.0500 139.6625 140.6250
141.1250 142.1500 142.2750 142.6625
143.3500 143.4000 143.4500 143.9500
143.9750 148.0250 148.0500 148.3500
148.3750 148.4000 148.6500 148.9500
148.9750 149.1875 150.1250 150.4000
150.6250 (Narrowband FM)

Pilot-to-Dispatcher
139.3000 142.3000 (AM)

US Navy Hydra Trunk Systems
395.000 - 395.9875, 397.000 - 397.9875 and 399.000 - 399.8750 MHz frequencies (12.5 kHz spacing, narrowband FM)

US Navy UHF Shipboard Trunk Systems
406.6500 406.7250 406.8500 407.0750
408.1250 408.7000 (Narrowband FM/P25)
454.0250 454.1500 454.3750 454.6250
456.1250 457.1000 457.5250 457.5500
457.5750 457.6000 (Narrowband FM/P25)

TABLE ONE: MAJOR MILITARY COMMUNICATIONS BANDS

SHORTWAVE
(Various transmission modes, frequencies in kHz)

3026-3152	4700-4745	5684-5726	6685-6760	8965-9037
11175-11271	13200-13257	15010-15097	17970-18027	23200-23250

VHF/UHF

Freq Range (MHz)	*Spacing (kHz)*	*Mode*
29.900		AM/Narrowband FM/Digital (P25)
30.010-30.550	10	AM/Narrowband FM/Digital (P25)
32.010-32.990	10	AM/Narrowband FM/Digital (P25)
34.010-34.990	10	AM/Narrowband FM/Digital (P25)
36.010-36.990	10	AM/Narrowband FM/Digital (P25)
38.270-38.990	10	AM/Narrowband FM/Digital (P25)
40.010-41.990	10	AM/Narrowband FM/Digital (P25)
46.610-46.990	10	AM/Narrowband FM/Digital (P25)
49.610-49.990	10	AM/Narrowband FM/Digital (P25)
118.0000-137.9750	25	AM
138.0125-143.9875	12.5	AM/Narrowband FM/Digital (P25)
148.0125-150.7900	12.5	AM/Narrowband FM/Digital (P25)
162.0125-173.9875	12.5	Narrowband FM/Digital (P25), excluding frequencies contained within the sub-band 173.200-173.400 MHz.
225.0000-379.9750	25.0	AM/FM/Narrowband FM
380.0000-399.9875	12.5	AM/Narrowband FM/Digital (P25)
406.1250-419.9875	12.5	Narrowband FM/Digital (P25), Note: For paired frequency operations, the frequencies in the range 406.1125-410.9875 MHz will be used for land station transmissions (or mobile receive), and frequencies in the range 415.1125-419.9875 MHz will be used for land station receive (or mobile transmit). Single frequency simplex operation is allowed from 411.0000-415.1000 MHz (12.5 kHz spacing)

❖ So how do you find new frequencies to monitor?

The first suggestion I'm going to make is that you get a subscription to *Monitoring Times*. You're going to get a boat load of frequencies in each and every issue. Look not only in this column every month, but also check out Hugh Stegman's *Utility World* column and loggings, as well as Mike Chace's *Digital Digest* for new HF military frequencies. In this regard a sub to *MT* is worth every penny you'll spend and you won't miss an issue if the newsstand sells out.

Second, when monitoring the VHF/UHF spectrum, learn to use the search button on your scanner. The big secret in searching military frequencies is to keep the search limits small. For instance, don't try to cover the entire 225-400 MHz range in one search. That is 7,000 25-kHz channels, and most scanners are not fast enough to make a search of a range that wide effectively!

Most milcom aircraft communications are short in duration, and the scanner has to be there in order to hear it. If you take 70 seconds using a 100 channels per second search speed to cover 225-400 MHz, you're going to miss a lot of activity. Keep your search ranges to within 10 or 20 megahertz and you will be more productive.

You should also search each range you have programmed for more than a day. Let it run for a week or more. Also remember that you will find more milcom activity during daylight hours (normal working hours for even the military folks) than in the nighttime. You should also do one full month of weekends in each search range you try (US military reservists only drill one weekend a month). Patience and the willingness to stick with a search and to compile the results will pay off in fruitful future monitoring activity.

So, if you would like to hear some military communications at your monitoring post, put our nationwide frequency list in your scanner, search and pounce on the HF radio frequencies listed in Table One, and use that search button on your scanner to prowl the various VHF/UHF ranges we have listed in this article. It won't be long before you will surely be rewarded with some of the excitement and intrigue associated with monitoring the military via radio.

BROADCAST BANDSCAN

THE WORLD OF DOMESTIC BROADCASTING

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With Lots of Watts

Is it a line from a ZZ Top song? I suppose so... Is it the meaning of the "WLW" call letters in Cincinnati? Probably not, though quite appropriate: For several years in the 1930s, WLW ran 500,000 watts. A petition filed by a New Jersey broadcast engineer would, if granted, lead to many of today's stations getting back into the "superpower" territory WLW was driven out of 70 years ago.

Richard Arsenault is a broadcast radio consultant – an engineer for hire. He's one of a number of such contractors, people who stations can hire to prepare FCC applications for technical changes; design and/or install new facilities; maintain existing stations; and determine whether a new station is feasible, among other services. Larger broadcasting companies like Clear Channel have engineers on staff, but most smaller stations contract with consultants like Arsenault.

In April, Mr. Arsenault prepared a Petition for Rulemaking, calling for significant increases in the daytime power of AM stations. In his petition, he notes the problems the AM service faces from noise – computers, compact flourescent lights, etc... He observes (with justification) that the limit to daytime AM reception today is no longer interference from other stations, but noise. Under current rules, during the day, most AM stations are protected from interference from other stations within the area where they provide at least "0.5mV/m" of signal. In practice, almost nobody receives useful service from a "0.5mV/m" signal in modern noise conditions.

The petition is quite simple. It asks that the FCC amend its regulations to allow all AM stations to increase daytime power by between 6 and 10dB. 6dB is a quadrupling of power; 10dB is an increase by a factor of 10. A 250-watt station could increase to between 1,000 and 2,500 watts; a 50,000-watt station could go to between 200,000 and 500,000 watts. At this time Arsenault is only asking for a daytime power increase; he notes that international treaties and the risk of interference to foreign stations limit the ability to authorize power increases at night. The petition does suggest nighttime increases might be considered at a later date if these international issues can be resolved.

It's certainly an interesting proposal. A ten-fold power increase certainly would do a better job of overcoming computer noise and penetrating steel buildings. During the day, interference between stations indeed is not generally an issue in this part of the country. However, this plan may not be as useful as it first seems.

Many stations would be unable to participate. For one thing, a new transmitter is not cheap! -- especially once you get beyond the 50,000-watt level. With many AM stations already at the margin of financial survival, an expensive transmitter upgrade may be beyond their means. For high-powered stations, pickup on consumer electronics may be a problem. For the same reason that modern consumer electronics *generate* interference, they are also susceptible to *receiving* interference. A 500,000-watt station is going to have to be a considerable distance from the nearest home/business, or it's going to come in on every cheap landline telephone/set of computer speakers/etc...

And then, there's the fact that "daytime" isn't always necessarily "daytime"... If you've ever tried DXing at sunrise, especially in winter, you've probably noticed that the DX doesn't instantly disappear when the sun comes up. It takes awhile. That 500,000-watt station on "your" channel, 500 miles away, might not be a problem at high noon in August. It may be a very serious problem at 3:00pm in December – when it may be officially daytime but DX conditions are almost as good as midnight.

The FCC appears to concur. About six weeks after Mr. Arsenault filed his petition, the Commission denied the request. They argue that the power increase would "...greatly increase the potential for interference between AM stations..." Will there be an appeal? Stay tuned. (At least this column does not require a power increase to overcome computer noise!)

❖ Gone, or maybe not?

Every business day, the FCC releases two Public Notices: "Broadcast Applications" and "Broadcast Actions." They're a quick list of routine paperwork filed by broadcast stations – applications to change power, to move the antenna, for a license for a new station, to transfer an existing license to a new owner, etc... And on occasion, a station that's decided it's no longer viable will surrender its license for cancellation. (This is happening with disturbing frequency with AM stations.)

In the May 17th Notices, it was noted WVMC-1360 Mount Carmel, Illnois had requested its license be canceled. Such requests are routinely granted; nobody is likely to object! However... this time, WVMC's licensee *did* object. They told the Commission the "operations manager" who claimed the station was off the air was *not* an employee of the station and did *not* have authority to surrender the license. Furthermore, they insist that, contrary to the contents of the letter requesting cancelation, WVMC is *not* off the air. Special Temporary Authority was requested, and granted, to continue to operate WVMC while the FCC investigates what happened.

❖ Interesting antenna

In Toronto, a novel directional antenna system is proposed. CHHA-1610 broadcasts to an audience located largely in the northwestern part of the city. Due to local interference issues, they were forced to move their antenna from the area where their audience lives, to an island just off downtown Toronto.

While they were able to increase daytime power to 10,000 watts, they're limited to 1,000 at night, and that's really not enough to adequately serve their audience. Making the situation worse, skywave propagation in the winter has resulted in CHHA causing considerable interference to CJWI, on the same frequency in Montreal. Industry Canada asked CHHA to temporarily reduce nighttime power to 250 watts – making the signal problem in northwest Toronto even worse.

CHHA has proposed to install a directional antenna. They wish to operate at 6,250 watts day and night; the directional antenna will reduce their signal in the direction of Montreal (to avoid interference to CJWI) and will, incidentially, increase the signal in the northwest Toronto area they wish to serve. At a traditional AM station, this directional antenna would be accomplished by installing a second tower. CHHA proposes something different.

They call it a "Hot Guy Wire." Normally, the "guy wires" which physically support the tower are not electrically part of the tower. Insulators are used at regular intervals to ensure the support cables are not resonant at the station's frequency.

CHHA plans to choose strategic locations for the insulators, to ensure the east-side guy wire *is* electrically part of the antenna. The bottom 45 meters or so (~130 ft.) of this cable will be intact –not electrically broken up with insulators – and will be connected to ground through an inductor. This inductor will set the "electrical length" of the cable.

By careful choice of this "electrical length," the station believes it can deflect the power that would otherwise be radiated towards Montreal, and redirect it to the north and south. Such installations have been made in other countries. At this time they are not permitted under FCC rules in the U.S..

❖ The Nashville Flood

There was a more comprehensive article on this subject in last month's *Monitoring Times*. Most of the stations silenced by the flood have returned to the air. WSM does continue to broadcast from their transmitter facility, as the cleanup continues at their Opryland Hotel studios. (The hotel is not expected to reopen until October – I'm not sure whether the radio station will return before or after that date.) WYFN-980 is still off, and there's a video on You Tube showing the flood damage to their transmitter.

WQZQ-1550 Clarksville is also still off. This station has a permit to change frequency and move to a new site. It's unlikely they'll bother to rebuild at the old location. You are likely to next hear this station on 830 from Goodlettsville. The photo shows the station's studio-transmitter link antenna – but the AM transmitter site is behind and to the left of the building – i.e., the antenna is pointed almost exactly the wrong way. It's now delivering a signal to FM translator W270BK, a few blocks in the opposite direction.

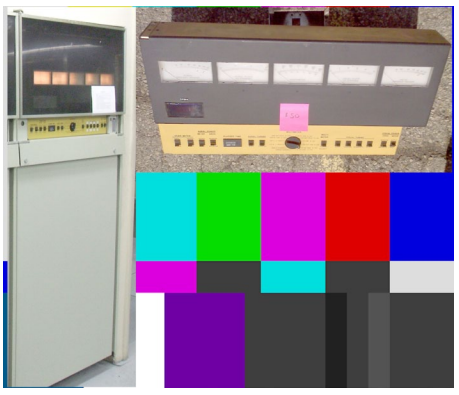
❖ Letters from Listeners

Larry Hay of Toledo noted my comment about hearing old hometown stations in a new location. Larry lived in Middletown, Rhode Island when his father was stationed there in the Navy. The local station in Newport is WADK-1540; when WADK went off the air at sunset, WPTR-1540 would come in from Albany, New York. Larry's other hometown station in Middletown was WPRO-630 Providence. At 2am one morning in December 1969, WPRO made the trip to Toledo, with the introduction to the local news.

That's a pretty good bit of DX. Except for WBZ 1030 and WTIC 1080, New England is difficult to catch from anywhere west of the Appalachians. I've never heard a Rhode Island AM station here in Tennessee and would be utterly delighted to land WPRO!

❖ You never know what you'll find at a hamfest....

A year ago, we were witnessing the demise of analog television in the U.S.. The left side of the picture shows the WSMV-TV Nashville analog transmitter a few minutes before it was silenced permanently. The right side... shows the control panel of a similar transmitter, for sale at the Dayton Hamvention for $50. Another ham was selling the control panel from a Townsend analog TV transmitter for a similar price.



On the left, WSMV-TV's analog transmitter in its last minutes of operation. On the right, part of a similar transmitter for sale at a hamfest...

❖ 'Til next month

Do you think DXing would be easier with 500,000-watt stations on the air? Would it be harder? Would it matter? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to dougsmith@monitoringtimes.com. Good DX!

URLS IN THIS MONTH'S COLUMN:

http://americanbandscan.blogspot.com My DX blog.

http://www.radio-broadcast-engineer.com/AM-interference-power.htm Richard Arsenault's petition for an across-the-board daytime AM power increase.

http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-10-973A1.txt FCC notice denying above petition.

http://sbe25indy.blogspot.com/2010/05/indiana-radiowatch-may-23-2010.html Indiana RadioWatch; scroll down to "Southwest" to read more about WVMC-1360.

www.youtube.com/watch?v=qBSJGfTnRI0 Video tour of flooded WYFN-980 transmitter site.

AM BANDSCAN STATION REPORT

NEW:

Permits granted for new stations:

Middleton, Idaho	1400	1,000/1,000 ND	(near Boise)
Mesilla, New Mexico	670	1,250/250 DA-2	
Bixby, Oklahoma	1210	7,500/250 DA-3	(Tulsa suburb)
La Grande, Oregon	1030	1,000/600 DA-N	
Providence, Utah	1090	5,000/250 DA-N	(just south of Provo)
Santa Clara, Utah	1290	2,000/250 DA-2	(near St. George)

New-station applications amended:

Santa Maria, California	1360	application amended from 1330KHz; power to 2,000 watts, directional.
Keeau, Hawaii	1250	application amended from 1240KHz; power to 5,000/1,500 watts.

New-station applications dismissed:

Raymond, Maine	650

Stations deleted:

Brooks, Alberta	1340	CIBQ	(granted move to 105.7 FM)
Lafayette, Louisiana	770	KJCB	
Eastland, Texas	1590	KEAS	

CHANGES:

Frequency & location changes on the air:

West Allis, Wisconsin	1460	WJTI	from Racine; power to 1,000/240 DA-2.

Frequency & location changes granted:

Apache Junction, Arizona	1260	KBSZ	from 1250 at Wickenburg, 3,500 watts daytime, 50 watts night
Pensacola, Florida	780	WPNN	from 790, 3,000 watts, daytime only, directional.
Lawrenceville, Georgia	1210	WDGR	from Dahlonega, 20,000/1 DA-D, plus 12,000 watts critical hours, directional.

Frequency & location changes denied:

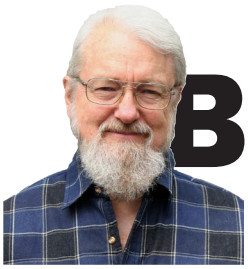
Vega, Texas	1600	KSHG	denied permission to move from Dalhart.

Callsign changes:

Robertsdale, Ala.	1000	WBZR from WNSI
Fresno, California	940	KYNO from KWRU
Fresno, California	1300	KWRU from KYNO
Apopka, Florida	1520	WBZW from WHIM
Coral Gables, Florida	1080	WHIM from WMCU
Jacksonville, Florida	1320	WJNJ from WBOB
Augusta, Georgia	1230	WEZO from WNRR
Springhill, Louisiana	1460	KTKC from KBSF
Kentwood, Michigan	1140	WVHF from WJNZ
Ontario, New York	1330	WDRE from WMJQ
Toledo, Ohio	1560	WWYC from WTOD
Milford, Pennsylvania	1450	WMJQ from WDRE
Nanticoke, Pennsylvania	730	WZMF from WNAK
Conway, S. Carolina	1050	WHSC from WIQB
Hartsville, S. Carolina	1450	WTOD from WHSC
Roanoke, Virginia	910	WFJX from WWWR
Charleston, W. Virginia	950	WBES from WVTS
Charleston, W. Virginia	1240	WVTS from WBES

The signs say WCTZ, but this Clarksville, Tennessee station's call letters are now WQZQ.

ND: non-directional
DA-N: directional at night only
DA-D: directional during daytime only
DA-2: directional all hours, two different patterns
DA-3: directional day, night and critical hours, three different patterns



BOATS, PLANES, AND TRAINS

PLANES

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Arrivals and Approaches

Cross-country airliner flights go through different and well orchestrated phases of flight from takeoff to landing. Upon descending from the en route phase at cruise altitude, the aircraft will begin the arrival phase and then proceed to the approach phase – all leading up to an Air Traffic Controller's handoff to the Tower for landing.

Air Traffic Controllers and the aircraft in all phases of flight may be heard on scanners in VHF aircraft band – 118 to 137 MHz in 25 kHz steps in the AM mode.

Communications between controllers and pilots during the arrival and approach phases can provide interesting and often fast-paced exchanges.

Let's take a look!

❖ Flying IFR

Airliners fly by Instrument Flight Rules (IFR) and you will often hear the term "IFR" as you listen.

In basic terms, flying IFR means that the flight can be conducted by looking at the instrument panel and NAVAID readouts, staying in contact with Air Traffic Controllers by radio, but not looking out the cockpit windows.

Airliners, and some General Aviation pilots, file IFR flight plans even when good weather is anticipated. If visibility becomes limited, the pilot can use his or her IFR training along with onboard avionics and instruments to safely continue the flight.

Class A airspace goes from 18,000 feet MSL (Mean Sea level) up to Flight Level Six Zero Zero (FL600, the equivalent of 60,000 feet). Aircraft that fly there are required to have IFR clearances.

❖ Instrument Meteorological Conditions

Instrument Flight Rules spell out the *rules* that must be followed when flying IFR. Instrument Meteorological Conditions (IMC) describes the weather *conditions* that require flying IFR. IMC is expressed in terms of visibility, distance from clouds, and the ceiling.

Instrument Meteorological Conditions call for the use of published arrival or approach procedures but during clear weather, a controller may or may not assign such a procedure. They may be assigned and used to optimize arrival traffic flow (spacing and speeds) into major airports on clear days to create an even rate that the airport can accept.

Published instrument arrivals and approaches, called out by name, are more complex and choreographed than everyday arrivals and approaches. For this article, being exposed to instrument procedures can help with understanding controller vectored arrivals and approaches that are less complex but do use some of the same NAVAIDs and named intersections.

❖ Arrivals : "The Descent"

An arrival procedure facilitates the transition from the en route (higher altitude) phase to the approach phase of flight for a given airport. When an IFR aircraft is about two hundred miles from its destination airport, the Air Route Traffic Control Center (ARTCC) controller will instruct the plane to begin its descent from its assigned en route altitude to a specified lower altitude. The instructions may include a named Standard Terminal Arrival Route (STAR). An ARTCC controller will hand off the flight to a local Terminal Radar Approach Control (TRACON) controller at some point during the descent.

Each STAR is depicted on a small aeronautical chart focusing solely on the specifics of the particular published arrival route. The way to understand this is to jump right in and look at such a "plate."

Go to **www.airnav.com/airport/KSMF** (Sacramento International - SMF, an example that works for all commercial airports) and scroll way down to and download the "CONCORD ONE" arrival under "STARs - Standard Terminal Arrivals."

On that particular plate, the text at the bottom says: "From over CCR VOR/DME via CCR R-020 and the MYV R-174 to ELKOE INT then via heading 340° for radar vector to final approach course. Expect descent below 10,000 after passing the SAC R-257."

STARs - Standard Terminal Arrivals

COMMO ONE	download (264KB)
HADLY TWO	download (229KB)
LOCKE ONE	download (336KB)
MADWIN FOUR	download (327KB)
MANTECA ONE	download (350KB)
MARVN ONE	download (252KB)
PANOCHE TWO	download (203KB)
RAIDR TWO (RNAV)	download (179KB)

These are the arrivals listed at AirNav.com for Oakland International Airport (KOAK), California as an example.

With the Concord One chart on screen or printed out, you may want to follow along. CCR is the Concord VOR – named for the nearby city – on 117.0 MHz. VORs (VHF Omni Range navigational stations) send out signals to create virtual spokes for each degree, called "radials."

The aircraft VOR receivers can allow tracking inbound to the VOR or outbound from the VOR on any given radial. VOR receivers can also be used to locate the intersections of two specific radials, each from different VOR stations.

The radials are in magnetic compass degrees clockwise from the VOR station with North being zero degrees. A VOR/DME station has the additional Distance Measuring Equipment component which can show the aircraft-to-VOR distance.

- "CCR R-020" means to fly outbound at a recommended altitude of 5000 feet from the Concord VOR station on the 020° radial.
- "MYV R-174 to ELKOE INT" means to follow CCR R-020 until it intersects MYV R-174 (Marysville VOR 174° radial – on 110.8 MHz). The intersection of these two radials define the ISYOH airspace "fix." The plane will then fly from the ISYOH fix to the ELKOE intersection.

  Named intersections and "fixes" are all five letters, pronounceable, most often with strange spellings, and can be looked up here **www.airnav.com/navaids/**.
- "ELKOE INT then via heading 340° for radar vector to final approach course" means that the plane will fly on that heading from the ELKOE intersection.
- "Expect descent below 10,000 after passing the SAC R-257" (Sacramento VOR 257° radial – on 115.2 MHz). This means to expect a controller's radar vectoring instruction to descend to a specified altitude below 10,000 feet upon crossing the Sacramento VOR 257° radial at a point between ISYOH and ELKOE. A controller may assign an "Instrument Ap-

proach Procedure" (IAP). This will end the arrival segment and begin the approach segment.

- The intersection of Sacramento R-312 and Marysville R-174 define the location of ELKOE.

Here are a couple of communications examples:

Oakland ARTCC / "Oakland Center" controller on 134.975: *SkyWest Sixty-Five Zero Seven, due to metering, now cleared direct Mendocino, then POINT REYES, the POINT REYES ONE Arrival. Mendocino is Echo November India*. Pilot Readback: *Direct Mendocino, then POINT REYES and POINT REYES ONE, SkyWest Sixty-Five Zero Seven.*

Oakland Center controller on 134.975: *SkyWest Fifty-Nine Thirty-Four, cleared direct POINT REYES, GOLDEN GATE FIVE Arrival San Francisco*. Pilot readback: *Direct POINT REYES, GOLDEN GATE FIVE, SkyWest Fifty-Nine Thirty-Four.*

❖ Approaches

The STAR will take the pilot to the beginning of an approach procedure or to a three-dimensional point where a controller will then vector the plane (give instructions on direction and altitude) as needed, with consideration for all the other area aircraft, rather than following a published approach.

As we listen to aircraft communications on our scanners, we hear reference to different named instrument approaches. Like the STAR plates, the approach plates are small aero charts that contain all the information specific to getting to and lined up for a particular airport runway. Approaches follow arrivals in sequence.

A published approach begins at the Initial Approach Fix (IAF) for the named approach. Some approaches have more than one IAF to accommodate arrivals from different directions and this will include an initial approach segment unique to each IAF. The IAFs will be noted on each approach plate.

All Instrument Approach segments begin and end with a published fix. Not all instrument approaches have an Intermediate Fix. The IAF marks the beginning of the approach and where further descent to the airport can be started. The initial approach segment is usually less than fifty miles from touchdown.

To see an approach plate with three IAFs, go to **www.airnav.com/airport/KOAK** and scroll down to "IAPs - Instrument Approach Procedures," and download "RNAV (GPS) RWY 09R" for a look. The three IAFs are at the GOBBS, MICRA, and REBAS fixes which begin the "initial approach." Planes from any of the three directions will pass through COMMO. The Final Approach Fix (FAF) is noted at ENCOL, the point where the "intermediate approach" segment ends and the "final approach" segment begins. The runway is shortly thereafter – after passing CAXIN. The profile view of the published descent can be seen at the bottom left.

An IAF can be a VOR, a DME fix, a named intersection, or less commonly an NDB (Non-Directional Beacon, on longwave).

You will see several STAR charts and

IAPs - Instrument Approach Procedures

ILS OR LOC RWY 22L	download (378KB)
RNAV (GPS) RWY 04R	download (227KB)
RNAV (GPS) RWY 22L	download (232KB)
VOR/DME RWY 22L	download (217KB)
VOR RWY 04R	download (252KB)

These are the approaches listed at AirNav.com for Sacramento Mather Airport (KMHR), California as an example.

Approaches listed for large airports at AirNav.com. The one called out by a controller depends on arrival direction, the currently active airport runway(s) at the destination airport, noise abatement agreements during certain hours, and possibly other air traffic considerations.

For instrument approach chart symbols, go to **http://naco.faa.gov/content/naco/online/pdf_files/8th_IAP_Symbols.pdf** and download *IAP Chart Symbols.* The first section there is for arrival charts. Approach plate symbols are on the eighth of the ten pages.

Lots of great navigational systems info for the serious reader may be found in the FAA *Instrument Flying Handbook*. Go to **http://www.faa.gov/library/manuals/aviation/instrument_flying_handbook/** and download Chapter 7, *Navigational Systems* (22 MB). On page 7-38 is a great graphic showing an ILS system with components identified.

❖ Approach Types

At **www.airnav.com/airports/** on the page for your airport of interest and way down under "IAPs - Instrument Approach Procedures," you will see the downloadable approaches listed for that airport.

The first part of the name for an Instrument Approach tells the type of approach based on the primary navigational aid (NAVAID) employed: VOR, VOR/DME, ILS, LOC, RNAV (GPS), or NDB. "RWY" is Runway. You will hear these called out on the radio. The last part of the approach name is the runway number that it applies to at the specific airport. Example: "ILS RWY 34L" Different airports offer a different variety of approaches.

- ILS Approach: The Instrument Landing System approach is defined as a "precision approach," while the others are defined as non-precision approaches. ILS uses both the Localizer (for lateral guidance) and Glide Slope (vertical descent path guidance).

  Localizer signals are transmitted in the 108.10 MHz to 111.95 MHz range. The Glide Slope signals are transmitted in the 329.15 to 335 MHz range. The directional patterns of the antennas for these two systems are very directional and precisely focused. Using these signals, instruments in the cockpit show if the plane is too far to the right or too far to the left with reference to the runway center line. They show if the plane is too high, or too low with reference to the descent Glide Slope.
- NorCal Approach on 125.4: *Continental Eighteen Eighty-Nine, three miles to the Initial Approach Fix, maintain two thousand until established on the Localizer, cleared ILS Sixteen Right Approach.*

  Pictures can be worth a thousand words. Go to **http://images.google.com** and enter "Instrument Landing System" (with the quotes) which brings up some nice images which can lead to informative articles.
- ILS OR LOC Approach: This means that a single approach plate can provide guidance for an ILS approach or just a Localizer approach. Example: Go to **www.airnav.com/airport/KSMF** and scroll to "IAPs - Instrument Approach Procedures" and download "ILS OR LOC RWY 34L." The large tapering arrowhead feature inside the circle represents the side-to-side guidance of the Localizer – ending near the left runway of the two parallel runways – Runway 34 Left. From the approach plate, you can see that the localizer is on 111.1 MHz – not something that would provide interesting listening.
- LOC Approach: A Localizer-only approach provides lateral guidance but no vertical descent guidance (no ILS / Glide Slope). For a good example, go to **www.airnav.com/airport/KFFT** (Capital City Airport in Kentucky) and download the "LOC RWY 24" approach. It is fairly straightforward. Near the runway (a short black line) is the Frankfort VOR. A plane from a more distant point could track inbound on the Frankfort 247° radial way before the Localizer provides its guidance.

  As with most plates, there is considerable information. On this one and off to the side is the Lexington VOR. Its 350°, 330°, and 314° radials point out NEBIY - the Initial Approach Fix (IAF), ZIFFL - the Intermediate Fix (IF), and ESTWO - the Final Approach Fix (FAF).
- VOR Approach: VHF Omni Range systems are assigned on given frequencies in the 108.0 to 117.95 MHz range. VOR approaches use a VOR as the primary NAVAID. Some are located at the airport and some where the VOR is located away from the airport. The pilot tracks inbound to the VOR shown on the approach plate and then outbound from the VOR while descending to the airport or to a point on a specified radial where a prescribed turn to the airport is executed while continuing to descend. The VOR approach is all based on pilot timing and speed, so he knows his location with reference to the fixes on the approach plate and in terms of the profile descent, since instrument approaches can be in clouds with no outside reference.
- VOR/DME Approach: DME is Distance Measuring Equipment (operates between 962 1213 MHz) and gives the pilot distance-to-VOR information which the VOR-only approach does not.
- RNAV (GPS) Approach: RNAV is "aRea NAVigation." GPS satellites provide three-dimensional position and speed. RNAV-equipped aircraft can navigate directly to an intersection, a VOR, or an Initial Approach Fix (IAF). The actual approach begins and an IAF.

❖ Closing Thoughts

Due to space limitations the "Visual Approach," "Missed Approach," and the less common "NDB Approach" could not be included but you can Google them.

The arrival and approach plates may seem daunting at first with all the detail, but the basics can be mastered with a little practice. Listening is more enjoyable when you better understand what the pilots and controllers are talking about. See you next time.

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
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Build a Broadband Loop (Part III)

This is the third part of our article on building a single-turn, broadband (40-500 kHz) loop. If you're just joining us, the loop is based on an article by Steve McDonald, VE7SL, and can be found online at **http://tinyurl.com/ygt39z7**. Rather than duplicate what is already available online, my goal is to chronicle my own experience in building and using the antenna. Feel free to join us if you would like!

❖ Where We Stand

Last month, we covered construction of the small preamp board and discussed mounting it inside the weatherproof conduit body (see Figure 1). The preamp is crucial to boosting the weak signals picked up by the loop and passing them on to your receiver at a usable strength. This month, we'll cover construction of the coupler circuit which connects between the loop, your receiver, and the power supply. The coupler is a simple circuit made with just five passive components – a few capacitors and resistors.

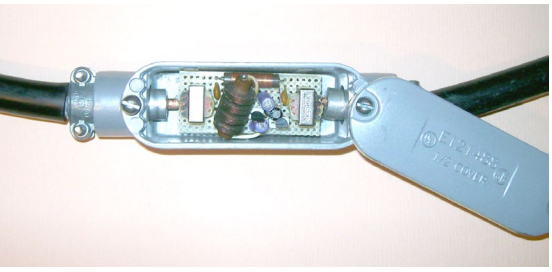

Figure 1. Photo shows Preamp circuit board mounted in conduit body *(Photo by Kevin Carey)*

❖ Why is a Coupler Needed?

The coupler isolates the power supply voltage (9-12 Vdc) from the RF signals coming down the feedline. We'll be sending DC power up the feedline to power the preamp, so it's important that this voltage not interact with the RF signals coming down the line. The coupler handles this issue. Without it, we'd need to run two additional wires (+/-) to feed DC power to the preamp. This would add not only cost and complexity, but also reduce reliability over the long term.

Figure 2 shows the schematic diagram for the coupler, and Table 1 lists the parts required. As with the preamp, the coupler can be built on a piece of universal "perfboard."

Nothing fancy is needed for the enclosure. Anything large enough to accommodate the board and external connectors (if used) would suffice. You can even get by without connectors by simply "hardwiring" the coax and DC power connections directly to the coupler board. The choice is yours.

I recommend making the board slightly larger than necessary to allow for drilling mounting holes, which can be used to secure the board in the enclosure with spacers.

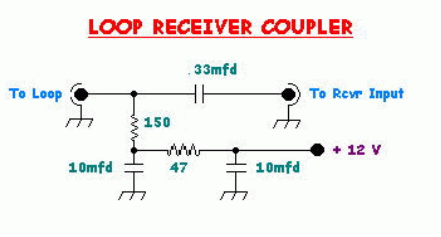

Table 1. Coupler Parts List

Qty	Part Description
1	0.33 uF capacitor
2	10 uF electrolytic capacitor
1	47-Ohm resistor
1	150-Ohm resistor

❖ What's Next

Next time, we'll describe connecting everything together, and testing the antenna prior to mounting outside. Finally, we'll discuss ways of mounting the loop, and go on the air for some DXing fun! Next month will be our final installment of the article, assuming everything goes well with the antenna. If you want to jump ahead, you will find all necessary details on the VE7SL website mentioned earlier.

In preparation for mounting the antenna, you will need: heavy wall PVC pipe (to serve as a mounting mast), U-clamps, a tripod (or other support), and a rotator to turn the antenna.

❖ From the Mailbag

We are pleased to hear from **Robert Homuth**, KB7AQD (AZ), who writes: "I enjoy your radio columns, as they remind me of the times I enjoyed a much lower noise floor on LF. I once got a QSL card from Montana beacon INE-521 kHz, but someone used it for a coaster, and destroyed it! I used to hear that beacon with a little AM radio tuned to the bottom end of the mediumwave band...but now I can't!"

"Are there still active beacons in the 515-530 kHz range? And, who uses the 1705-1800 kHz range in North America? Via the WebSDR in Holland, the operator had a temporary SDR receiver for the 160M band, and I could log SSB ship-to-shore traffic audible in Holland. Do I have to wait for Europe to propagate in, or are there closer navigation targets to DX closer to home?"

Hello Robert, and thanks for writing to *Below 500 kHz*. I'm sure more than a few listeners' QSL cards have been lost to "coaster service," as not everyone sees the value in documenting these rare catches like we do! Indeed, the noise floor on LF has risen considerably in recent years, due in large part to all of the personal electronics in our lives today. Recently, I discovered that even a cell phone on charge can generate significant noise on a nearby AM receiver.

The 515 to 530 kHz range does host a few navigation beacons, but they are not as numerous as in the 190-285 kHz range. The *BeaconFinderII* directory lists all known stations from North America in this range.

As for the spectrum just above the AM Broadcast band, this has always been somewhat of a "catch all" band for radio allocations in North America. Several years ago, it was used extensively for cordless home phones. Typically, the base unit transmitted on the MF band, while handheld phones transmitted in the VHF low-band (49 MHz) range. The arrangement worked fairly well, except for occasional interference from electrical storms, which is generally not a good time to be on a telephone, anyway!

A number of South American beacons have been heard over the years in this frequency range as well, with Colombian beacon MER (Mercaderes) on 1685 kHz being one of the most common reported. With the expansion of the AM Broadcast Band up to 1705 kHz, much of this activity has either gone away, or is no longer audible in North America. A list of some activity from LF up through 2000 kHz can be found online at **http://dxworld.com/cgi-bin/bcbdx.sh**.

Another type of station in this range are the so-called "fishnet" or "driftnet" buoy beacons. These are unattended, low power transmitters (typically 1-10 watts) with whip antennas, and they are used to mark the position of fishing nets used at sea. Despite their low power, they are often heard for hundreds of miles beyond their intended range. They transmit identifiers in Morse Code with varying formats, but often use a "KA" prefix, followed by a series of numbers

and letters. I believe some of these stations are now using data burst transmissions, possibly containing GPS information.

Al Underwood (NY) initially brought these driftnet stations to my attention. He was a pioneer in understanding their purpose, location, and legality on the airwaves. Al kept extensive lists of driftnet beacons and wrote the FCC, ARRL, Greenpeace, and others to seek further information on them. Besides the potential for harmful interference in the 160M ham band, the legality of drift net fishing is also a concern, in light of UN and EU treaties banning the practice.

Regrettably, Al was not able to get much information from the groups he contacted, nor did they show much concern for the transmissions. Even more surprising, he has heard hams actually try to "contact" these beacons on 160 meters! The last I knew, Al had stopped trying to work with these organizations, but my hat is off to him for being one of the first to call attention to these transmissions and getting involved on a grass roots level.

One final type of station you might hear in the upper end of the Broadcast band are MEDFER stations (Medium Frequency Experimental Radio Stations). License-free transmissions are allowed by the FCC from 510 to 1705 kHz, with 1/10 of a watt and a 3-meter long antenna. A good place to learn more about these stations is at the Longwave Club of America's website (**www.lwca.org**).

Robbie Spain, KD7CJO (WY) wrote with an inquiry about a very strong station he heard at 59.25 kHz USB. The signal was 5/9 +20dB, and appeared to have on-off keying just like a typical beacon. Robbie, I am almost certain the station you heard was WWVB in Fort Collins, CO, which operates 24/7 on 60 kHz. Although the signal sounds similar to CW Morse Code, it is a pulsed data stream that uses reductions in carrier power to signify time increments.

WWVB is the sister station to the well-known WWV, which operates on 5, 10, 15, and 20 MHz providing time of day voice signals. WWVB does not use voice of any kind, and its signals are used by many laboratories as well as wall clocks and even some wristwatches. More information on WWVB can be found at **http://tinyurl.com/27ehkea.**

Robbie also submitted some beacon loggings, which I was able to confirm using the BeaconFinderII and online sources. These are shown in Table 2 below.

Table 2. Selected Beacon Loggings From WY

Freq.	ID	Location
290	AOP	Rock Springs, WY
266	SAA	Saratoga, WY
368	SIR	Sinclair, WY
392	PNA	Pinedale, WY
520	IQS	Salliaw, OK

John Wheaton (TN) wrote to say that he appreciated seeing his logs listed in the April issue of *Below 500 kHz*. These were some of John's best DX loggings to date. His only regret was a spelling error in the location of German time station DDH47 (147.3 kHz). The location should have been shown as "Pinneberg."

John also notes that beacon PBC/365 kHz remains on the air despite a statement to him by the Maury County airport early this year that it would be decommissioned "in two weeks." It is also still sending the incorrect ID of PBK instead of PBC. John estimates that there are still about 30 NDBs on the air in Tennessee.

Thanks for the update, John, and very often a beacon will be kept running long past its planned decommission date as a result of bureaucracy or requirements to continue as long as the information is published in aviator documents. The fact that it is still sending the incorrect ID is interesting, and shows that no one is monitoring it very closely (or they do not know the code well enough to detect the error!). Please keep us posted on this station.

See you next month!

Read a Good Label Lately?

You could learn a lot! Look at your MT label before you throw your wrapper away - it tells you how many issues you have left in your subscription. If two or less, renew right away to avoid missing an issue. Keep those MTs coming and we guarantee you'll learn a lot!

WARNING: If you get a neon yellow wrapper on your magazine, don't throw it away: That is your renewal notice! Cut the card out of the wrapper and send it in with your payment. You'll get two notices and then it expires. So take care, don't let your subscription die!

ANTENNA TOPICS

BUYING, BUILDING AND UNDERSTANDING ANTENNAS

Dan Farber, AC0LW
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The Balcony Bent Dipole

Compact Stealth, Amazing Performance

This month I'd like to share with you another of the excellent antennas fed with ladder line that I've used with great results. This one combines stealth, compact design, and surprisingly good performance. I felt this would make a good counterpoint to the big outdoor dipole I've been raving about. No doubt many of you were thinking, "Hey, Dan! Nice dipole, but it's not exactly the stealthy type of antenna you're always going on about!" Hopefully this month's antenna will restore some of my "stealth" credentials.

Regular readers of my column will recall me whining about having a shattered elbow a couple of years ago (see "How's It Hangin'?" May 2010). In truth, the injury was severe and I missed a year of work as numerous surgeries and incredibly painful therapies kept me sidelined. With my left hand and arm completely offline (I am left-handed), I was nearly helpless for a long time, so I stayed most of the year with my then-girlfriend. Since I was down to one hand, radio seemed like a good a way to pass the time.

❖ Balcony Tricks

Her apartment was on the second floor and had the usual wooden balcony, the "roof" of which was the floor of the third-floor balcony immediately above. I thought about trying one of those apartment verticals that employ a whip antenna clamped to a railing. The whip is loaded with a coil at its base that has a clip lead to select the right coil tap for each band. Coaxial cable is used to feed the antenna, and a counterpoise ground – really a single ground radial – is provided by a reel of wire that connects to the ground braid of the coax. A quarter wave length of ground wire for a given band is unreeled and laid across the floor or dangled over the side of the balcony – or even, heaven forbid, laid across the shrubbery or the lawn.

Although this is an elegant enough idea and no doubt serves many hams and listeners well, I could see a number of problems with it relative to my particular situation. For one thing, the clip lead jumper on the coil and the reel of counterpoise wire were just not physical tasks that I felt able to handle. My doctors would have had a conniption to see me, one arm heavily splinted and bandaged, staggering Vicodin-addled onto the balcony to struggle one-handed with jumper and spool every time I wanted to change bands, or even QSY very far within a band.

In addition, I didn't like the "stick-out-like-a-sore-thumb" factor that the whip and the counterpoise would have. Since I was setting up shop in an apartment building, it didn't pay to make my operation highly visible. The landlord there was pretty strict about what a tenant could and could not have on a patio or balcony. Flower pots and knickknacks, yes. Aerials and dangling wires, not so much.

So, as I've done since I was a teenage Novice and SWL in the early '70s, I looked at the possibility of rigging up some sort of – wait for it – DIPOLE!

This time, a dipole would be a real challenge. First I tried the obvious solution of running a normal dipole across the ceiling of the main area of the apartment. In fact, I was able to put up a 40 foot dipole running diagonally from above the front door, across the dining room and front room ceilings, to an opposite corner by the patio door. We routed the ladder line to the wall and brought it down to a small table against the dining room wall, and I thought I was in business.

Unfortunately, I had not stopped to consider that I was surrounded by a building full of metal. Though the dipole was plenty long enough to load up on every band from 7MHz on up, I had great difficulty getting a match on most frequencies. The stations I could hear were buried in noise, and when I transmitted, I wiped out the phone, the TV, and the computer in the apartment I was in. I presume the other units in the building were similarly affected, although no one complained.

What to do now?

I realized that I had to get the antenna outside. This presented formidable problems. Very little antenna length would be possible, and I wanted as much stealth as I could realistically get. I finally settled on a dipole, bent to fit the frame of the balcony. The horizontal section ran across the top beam, almost exactly on an east to west azimuth, and the bent ends ran down the two outer pillars. Total length was a mere 28 feet, with a 12 foot horizontal section and two 8 foot

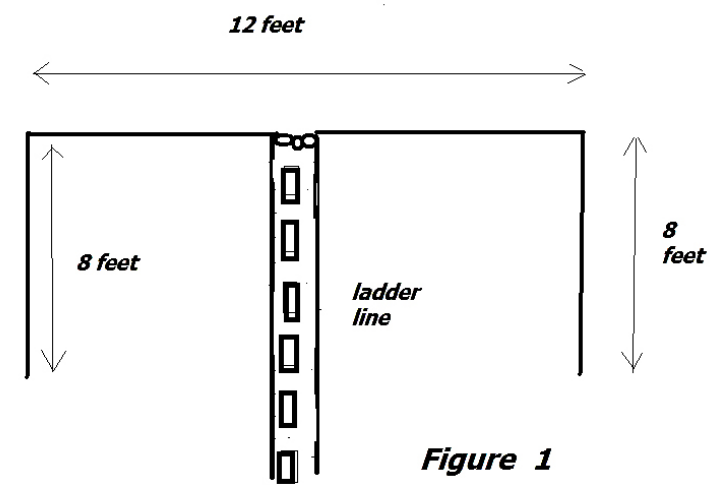
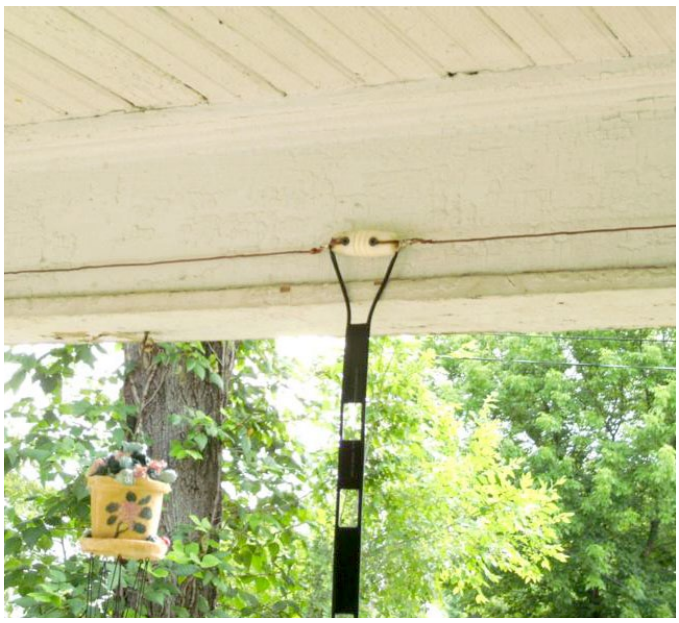


Figure 1



The dipole fastened to the inboard side of the balcony upper beam. Only the "mini-trellis" ladder line is visible from ground level. (Photo by author)

ends, dropped at 90 degree angles. (See Figure 1.)

Since all this wire was on the inboard side of the balcony, though, none of it was visible unless you were actually in the apartment looking out the patio door. The ladder line was visible from the ground, but we prepared a story about it being a "mini-trellis" for vining plants. She even put some morning glories near it in pots, though I don't recall them actually vining up the ladder line. (Too much RF energy, maybe?) At any rate, no one ever noticed the ladder line. If they did, they didn't mention it. (See photo.)

Another obstacle was routing the ladder line from the living room to the patio. We eventually came up with an arrangement of a four inch thick piece of foam rubber cut to the length of the door height that the door was closed against. A slit near the bottom provided a passage for the ladder line. This was clumsy when she went out to water plants, but we learned to deal with it. The foam rubber provided good isolation of the ladder line from the metal door frame, and also made a very nice heating/air conditioning seal. The overall length of the ladder line was about 16 feet, with my operating position on a small table not far from the patio door.

Also, as you might guess, this setup, on the second floor, meant no ground wire of any kind. I disconnected the feedline from the tuner whenever lightning threatened, but I had no RF ground. That, and the severe shortness of the bent dipole, made the results nothing short of miraculous.

❖ Spectacular Results

First, the antenna was very quiet on receive. I started out by checking WWV at each frequency (2.5, 5, 10, 15, and 20 MHz) and trolling around in the shortwave broadcast bands. WWV was loud and clear, and SW stations all over Latin America and Europe came rolling in. This was only a prelude, though, to the thrills awaiting me on the ham bands.

I had hoped the dipole would load up on every band from 20 meters on up, since it was almost a quarter-wave long at 14 MHz. And, it did indeed load up very nicely on all these bands: 20, 17. 15, 12, 10, and 6 meters. What astonished me, though, was the way it loaded up on 30 – 40 – *and even 80 meters!* I really don't know what to make of that, but I have a plethora of contacts logged during that period on those three bands to tell me I'm not imagining it. It would not load up on 160 meters, and I don't see how anyone could expect it to. But, it worked stations all over the region on 80 meters, and the nation and some DX on 40 and 30 meters. My trusty MFJ 969 tuner triumphs once again!

The real excitement, though, came on the higher bands. In the log, I find, among other marvels, 3B8CF in Mauritius on 20 meters; FO5RH in French Polynesia, on 17 meters; UA3TCJ in Russia on 15 meters; EA8ID in the Canary Islands on 12 meters; and V51AS in Namibia on 10 meters. In addition, I worked folks all over the United States on six meters – a special thrill, since I had never been on six meters before. The balcony bent dipole certainly gave me a nice introduction to this "magic band," in addition to all the great DX on the HF bands.

To top it all off, I made all of these contacts with the power on my Yaesu FT-897D dialed down to 25 watts, since I was trying to avoid causing any interference with electronic devices in this building of twelve apartments. Not quite QRP, but between the lowered power and the very short antenna, I was tremendously pleased with the results.

❖ Lemons into Lemonade...

This last point I want to make isn't exactly antenna stuff, but bear with me. One unexpected benefit from the temporary loss of the use of my left arm was that I had to learn to send CW using my right hand to operate the paddles. Now that I have the left hand back to write with, I can send with one hand and log or copy with the other, just like the contesters do! I must say, it is much more efficient. Try it, if you haven't yet.

Need I say more? I ended up using this particular antenna arrangement because I was laid up and not able to use my home QTH. I don't doubt, though, that many of my fellow hams and SWLs find themselves living long-term in an apartment much like the one this tale takes place in. If that's you, and you thought that you can't have an effective antenna, I urge you to try this antenna or a variation to fit your particular circumstance. It will definitely put you on the air effectively, as my own results show.

Be careful out on that balcony, and I'll see you next time with more antenna adventures. Happy operating!

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ
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The BC-344 Operating Nicely

Last month I had every expectation of buttoning up the BC-344 project but, as seems to be the pattern with this particular project, I hit yet another snag. This time it was the adjustment of the i.f. transformers – normally a very quick and satisfying procedure. I could find no discernable peak in the response of the first detector, first i.f. or second i.f. transformers, no matter how far I moved the adjustment screws.

Suspecting the second i.f. transformer, I had slipped off its can and found a 0.01 uF paper capacitor that had been installed behind a terminal board. Clipping one lead so that I could test it in a capacitor checker, I found that it was indeed leaky. This month's work session began with the removal and replacement of that capacitor, which was accomplished with some difficulty.

The manual suggested that, encountering trouble in the i.f. strip, one should move the test signal (which had been injected at the first detector [mixer] grid) down to the end of the line (second i.f. grid). This would allow checking that stage in isolation and, finding it good, one could move back to the first i.f. transformer to check for trouble there.

I thought that this was a good plan, simply because, with all the tweaking, not to mention the capacitor replacement, this i.f. transformer had to be well out of adjustment.

❖ Stopped by an Odd Phenomenon

However, I was stopped in my tracks by yet another odd phenomenon. Connecting the modulated 92.5 kHz test signal to the second i.f. tube grid, the signal came barreling out of the speaker at high volume and was not affected by the gain control, though there was no problem controlling the volume of signals passing through the receiver normally.

This was only a problem with the receiver set for manual volume control (MVC), which is required for these adjustments. Set for automatic volume control (AVC), gain of both the normal and injected signals was controllable. (Adjustments that involve the peaking of signals can't be done with AVC because, obviously, any peaks would be flattened out by the AVC action.)

Readers of last month's column will remember that I had some trouble with the circuitry associated with the volume control, so I immediately figured I had misconnected something in correcting it. This was something of a daunting prospect, because the coupling capacitor I had changed was buried in a small circuit board that, in turn, was buried under the gain control – which had to be dismounted to make the fix.

I spent quite a bit of time studying the schematic to see if I could scope out other possible sources of the problem. It was obviously associated with the circuitry around the second detector/first audio amplifier stage – which includes the mvc-avc switching as well as the power on/off function. The schematic in this area is quite dense – especially at the reduced size required to fit the whole thing onto one of the manual's 5-1/2" X 8-1/2" pages.

❖ Not a problem After All!

I didn't find the answer until I had scanned that area of the schematic and blown it up several hundred percent. And I'm grateful that the quality of printing in this government manual was so fine that the blow-up was more than legible. I'm including a copy with this article, though it won't be practical for us to run it at the size that I used.

So what was the answer? It turned out that there was no problem at all. The receiver's gain control is a dual potentiometer (two potentiometers on the same shaft). One of these (R10) controls the cathode bias on the first and second r.f. amplifiers under MVC conditions, but is bypassed when the receiver is switched to AVC.

The other one (R29) controls the gain at the first audio amplifier under AVC conditions, but is disconnected when the receiver is switched to MVC.

Since there is no gain control after the second r.f. stage under MVC conditions, it made perfect sense that I was unable to control the gain of a signal injected after that point. So I could relax! I had made no tragic mistake in last month's installation of the coupling capacitor and could now proceed to address the i.f. amplifier problem.

But while we're talking about these controls, it's worth mentioning that the hams of long ago, back when military receivers were appearing on the surplus market cheaply and in great quantities, liked to replace the original double potentiometer with two single ones. The mvc pot became an r.f. gain control; the avc pot an audio gain control.

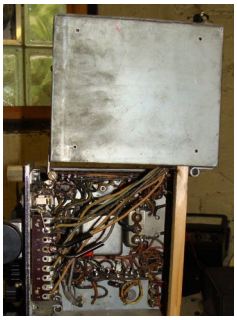
Today's purists hate to see that extra pot – sometimes replacing the dial light control; sometimes occupying an extra hole drilled for the purpose. This receiver escaped modification because it is a low frequency version not suitable for ham use. However, many were the indignities heaped upon this set's sister radios, the BC-312/BC-342! Those HF sets covered all of the ham bands below 10 meters.

❖ Getting Back to the I.f.s

With concern about the perceived audio problem relieved, I was free to turn my attention to the i.f. problem. So, once more I hooked up the signal generator, set at the i.f. frequency of 92.5 kHz, to the second i.f. amplifier grid. The VTVM I've been using as an output meter was connected, as usual, to one of the headphone output jacks.

Using the attenuator on the signal generator, I reduced its output to the minimum that would give a good indication on the meter and tried tweaking the adjustments on the i.f. transformer. I was pleased to find a peak on both adjustments. I can't say that the peaks were as pronounced as I am used to seeing when adjusting the 455 kHz i.f. transformers on broadcast or shortwave receivers. But they were peaks.

I decided to check the other i.f. transformers for similar capacitors. This was easy to do, because each shield can could easily be slipped up and off the transformer body after removing the four retaining screws at the top. The first detector transformer had no paper caps in evidence, but there were two in the first i.f. transformer.



The BC-344's a.c. power supply (square box) is swiveled out of the way and propped up to gain access to underchassis for making i.f. transformer adjustments.

The location of this transformer was such that it would have to be removed from the radio in order to get the clearance needed to remove even the easiest to get at of the two caps. To get at the other one, there would have to be some dismantling of the transformer itself. Looking at the prospect of accessing the transformer's mounting screws

and wire connections in the dense wiring under the chassis, it didn't seem too outrageous to give this transformer a chance without modification!

This is the i.f. transformer (first i.f.) that I didn't recap because it would have to be removed to do the job.

And so, after replacing the transformer shield cans, I reconnected the signal generator output to the first detector grid – which meant, of course that the signal would now traverse the entire i.f. chain. I re-tweaked the peaks at the second audio transformer and then moved back through the first audio transformer and first detector adjustment. And at each location, I was finding peaks of about the same magnitude as those I was seeing at the second i.f. transformer.

I have to admit, I would have liked to have seen sharper peaks, and perhaps one of our readers with more experience with LF receivers could let us know if shallow peaks are a characteristic of low frequency i.f.s. When restoring a BC-453 190-550 kHz command receiver on these pages some years ago, I recall that the electronic coupling within the i.f. transformers had to be loosened to provide a sharper response during adjustment. This was done by temporarily pulling up adjustable rods.

In any case, this radio seems quite lively, at least on the broadcast band, connected only to a short antenna on the basement floor. I'll consider this a job well done until experience with the set proves it otherwise!

❖ The C.W. Oscillator Adjustment

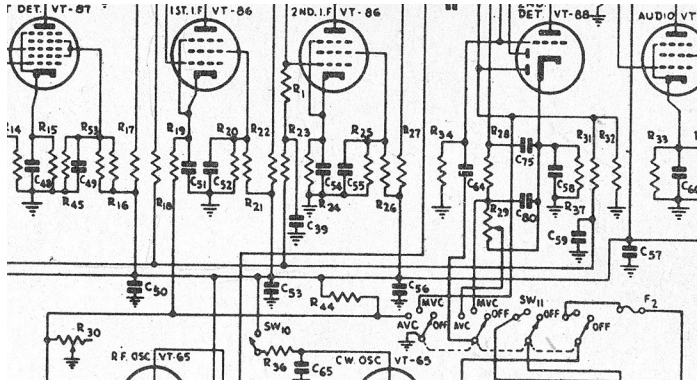
With the adjustment of the i.f. chain completed, the next step is to adjust the c.w. oscillator, the output of which beats against the i.f. signals to provide a musical note from c.w. signals picked up by the receiver. These signals would otherwise be heard only as a low intermittent hissing – or not at all.

To perform this adjustment, the signal generator is left set and connected as before, but its internal modulator is shut off. A cap covering the c.w. oscillator trimmer is located just above the c.w. oscillator "on-off" switch. The cap is temporarily removed for adjustment of the trimmer, which is set so that the c.w. oscillator zero beats the signal generator signal with the arrow on the c.w. oscillator control in a horizontal position.

This adjustment went quite smoothly and as the maintenance manual led me to expect.

❖ The R.F. Oscillator Adjustments

The r.f. oscillator, which beats against the received signal to produce a difference frequency at the intermediate frequency (the latter is in turn amplified by the i.f. chain), is responsible for the calibration of the receiver. There is an oscillator trimmer for each of the radio's four bands and each one is adjusted so that a signal generator signal at a specific calibration frequency comes in at that same frequency on the radio dial.



Schematic showing MVC-AVC switching and MVC (R30) and AVC (R29) gain controls (see text).

The calibration frequencies for each band are: A – 255 kHz; B – 440 kHz; C – 800 kHz; D – 1450 kHz. The oscillator trimmers for each of the four bands are accessed through four labeled openings at the rear of the oscillator compartment at the left side of the receiver.

Each opening is protected by a screw-on cover that is temporarily removed to make the adjustment. Like the adjustments on the i.f. transformers, these trimmers are retained by lock nuts that must be backed off before the trimmer can be moved. A 5/16" nutdriver, which just clears the opening, does the job nicely.

To do the calibration, the c.w. oscillator is turned off and the modulation of the signal generator (which is still connected to the fist detector grid via a 300-ohm resistor) is turned on again. Starting with band A and progressing through band D, the signal generator and receiver dial are set to the appropriate calibration frequency, and the trimmer is carefully moved to correct any discrepancy in the receiver dial reading.

The first r.f., second r.f. and first detector cans, with four trimmers each, are above. The four oscillator trimmer access openings, with covers in place, are below.

Extreme care has to be exercised here, because the adjustment is very sensitive, with tiny movements of the trimmer causing large changes in oscillator frequency. A movement that is too gross could result in the oscillator frequency being adjusted on the wrong side of the received frequency – resulting in a dial reading that will be correct at that single point on the dial only.

Unlike the i.f. adjustments, which were a little too vague to suit me, these oscillator adjustments were very smooth, definite and positive. They were fun to do, actually. The original band A and B settings were pretty close to correct, requiring only minor tweaking. Band C and D were farther off, with band D being the worst. I had to do the band D adjustment in stages so I would not lose my place – moving the dial a little closer to the correct reading each time.

❖ Radio Frequency Alignment

Remember those three cans we removed and recapped much earlier in this restoration? The ones that were skewered like shiskabobs on the bandswitch shaft? They contain coils and capacitors to tune the grid circuits of the first r.f., second r.f. and first detector stages. Now they have to be adjusted.

Each can has four adjustment trimmers, one for each band. The adjustment frequency for each band is the same as that used for the oscillator adjustment. These trimmers, too, are secured in place by locknuts that must be backed off before adjustment is possible. The signal injection point is different for each stage.

The signal generator output is connected (through a 250 pF capacitor) to the grid of the 2nd r.f. stage to tune the 1st detector; the first r.f. stage to tune the 2nd r.f. stage, and the antenna post to tune the first r.f. stage. The tuning progresses in the order given for each band in turn – setting the bandswitch to the correct band, the signal generator (modulated) to the correct frequency, and maximizing the receiver output with the appropriate trimmer.

Like the oscillator settings, this all went very smoothly and positively, leaving little room for doubt. This concludes our work on the BC-344 except for a little cosmetic work. Removal of some caked-on storage dust and some paint touch-up on the cabinet will make a world of difference in the appearance of this set. We'll show you the results next time.

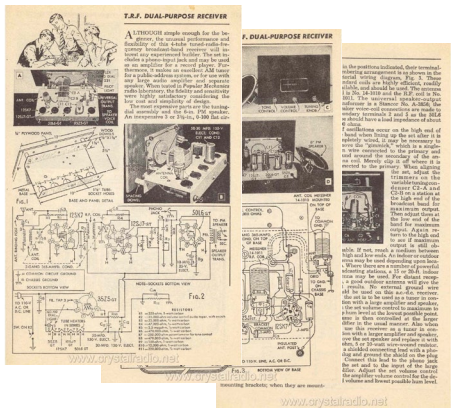
TRF-4 "Retro-Tech" Construction

By Hal Bilodeau

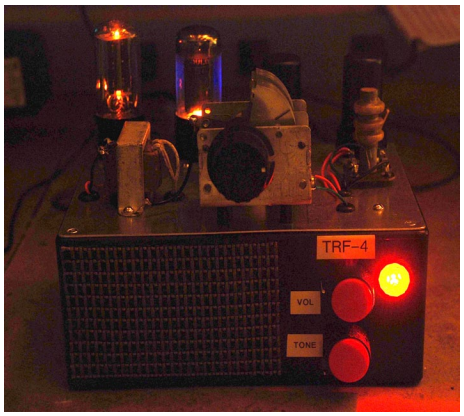
I have always been fascinated with all types of technology. As a child, I frequently took things apart in an attempt to figure out what made them work. Those objects were never put back together the same way they were built, bringing down the wrath of my parents on many occasions. Fortunately, I eventually obtained extensive training in this area and now I get to do it professionally, as well as for a hobby.

With an impending four to six week leave of absence from work due to a temporary medical condition, I began searching for a technically challenging yet enjoyable construction project to fill the time. An Internet search yielded several good possibilities, including the project listings on the **www.crystalradio.net** website.

This website lists all types of radio projects, from the simplest crystal radio sets to sophisticated tube projects. I soon decided to try one of the tube radio projects (**www.crystalradio.net/tubeplans/xximages/4plustube/TRFdual-pruposereceiver_1.jpg**)



This is a standard tuned radio frequency (TRF) AM broadcast receiver that doubles as a small audio amplifier. After all, who can resist the soft glow and warm tones generated by receivers equipped with this technology? Tubes



used to be hidden inside wooden or plastic cabinets behind fancy dial faces. This project would be different, highlighting the four constituent tubes.

❖ Finding Parts for a Retro Project

The first challenge was to identify all of the parts and to find sources for them. In all, five sources were found:

1. Playthings of the Past (**www.oldradioparts.com**) for tubes, coils, capacitors, variable capacitors, and the audio output transformer.
2. Radio Shack (**www.radioshack.com**) for the chassis box, wire, fuses, and pilot lamp
3. Mouser (**www.mouser.com**) for resistors, volume and tone controls, and the loudspeaker
4. Antique Electronic Supply (**www.tubesandmore.com**) for terminal strips, solder lugs, and fuse holder
5. Ebay (**www.ebay.com**) for tubes and tube sockets

Playthings of the Past has a vast selection of vintage parts, including the original specification sheets. This was extremely helpful adapting several substitution parts that were wired differently than the parts specified in the project article. I'd strongly suggest carefully reading the instructions on the website regarding stock inquiries. It is also helpful to be ready with second choices for components with limited stock levels.

In all, it took about one and a half weeks to obtain all of the required parts. The tube sockets came first, allowing for the initial construction of the chassis. Radio Shack stock number (270-1809) was selected for this. The dimensions are slightly smaller than what was called for in the construction article, but still adequate.

There are also plastic and metal tops provided for the project box. The metal portion fits into the plastic, making it necessary to remove most of the plastic for a good fit. Only the mounting holes and frame should be left from this for the best fit.

❖ Construct with Care

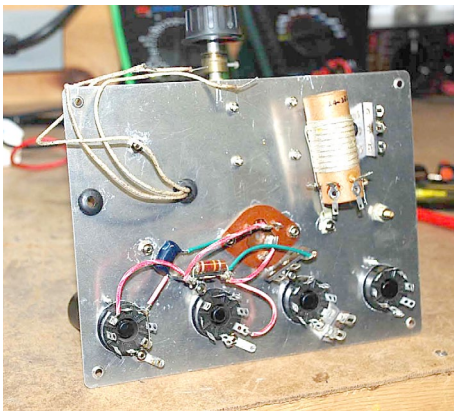
A drill with a boring drill bit of 1" was used to create the tube socket holes and a hole for the power supply filter capacitor. Holes were also drilled for mounting the audio output transformer, RF coil, antenna coil and variable tuning capacitor. Provisions for wiring running from inside the chassis box to these components were also made.

A standard drill was used to make the holes, but great care was needed for this to be done correctly. Use a drill press if possible for the greatest accuracy. Caution was exercised in the mounting of the tube sockets to insure that the "key" was oriented in the direction recommended in the construction plans. This makes it possible to easily follow the physical layout and wiring diagram provided in the article.

The only variation in component layout from the plans was the placement of the power supply filter capacitor. This was placed forward of the tube lineup to compensate for the smaller chassis.

Once all components were mounted, it was time to begin the main body of construction. Stranded wire rated at 300 volts was obtained from Radio Shack and used for connections. An oversize printout of the physical parts layout was made and acted as a "road map" for wiring the project. All of the connections were traced on the printout as they were made to insure

the accuracy of all connections. Shrink tubing and wire discards were kept for shorter wiring runs and for covering bare component leads to prevent shorts. Although this design requires more wiring, it is done to prevent the chassis from being "hot."



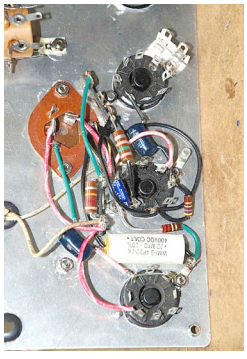
Construction itself took place over three or four days. Wiring and component placement was begun from the leftmost tube socket, which is the 35Z5 rectifier, and proceeded to the rightmost socket. Tools used were a needle nose pliers, variable temperature soldering iron, nippers, and something to hold and dispense solder.

I also use an exhaust fan to draw away solder smoke (made from an old computer power supply fan exhaust) and a magnifier lamp. Solder braid or some sort of de-soldering device is also highly recommended. Soldering a given point was not done until all connections to that area were made.

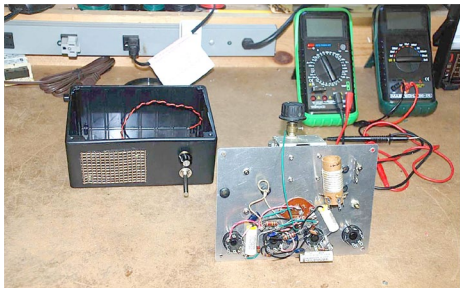
As mentioned previously, the chassis itself is not "hot." Great care is used to isolate it with additional wiring. It is strongly recommended that, when making the hold for the power supply filter capacitor, you insure that it is larger than the component itself so the capacitor can does not touch the chassis itself. The can is used for common ground. Also use the supplied insulator when mounting it to the chassis.

Point to point wiring is very different from circuit board component placement and soldering. This really gives a person an appreciation for how far we've come in the past 50 years! On the surface, one might think it is quite easy. The wiring requires a great deal of care and attention to physical and layout details. Comparing this to the schematic was also helpful in questionable areas. One of the big drawbacks of the article illustrations is that they are in black and white, making it difficult to distinguish between some of the connections.

Again, I cannot stress enough how important it is to pay attention to orientation marks and the specification sheets for components. Substitutes for this project were needed for the antenna coil and audio output transformer, and connections to these devices are different than what is specified in the article. Stay alert!



The time for final assembly arrived quickly. The volume and tone controls, pilot lamp (not needed but added), antenna jack, audio output / input jack, and fuse were mounted inside the box portion of the project box. The two and a half amp fuse was another accessory that was added to the design for additional safety. Extra wire length was used to insure that the chassis portion could easily be removed, allowing ample access to the inside of the box. The speaker opening was covered with old speaker grill cloth for an authentic look.



❖ Smoke Test

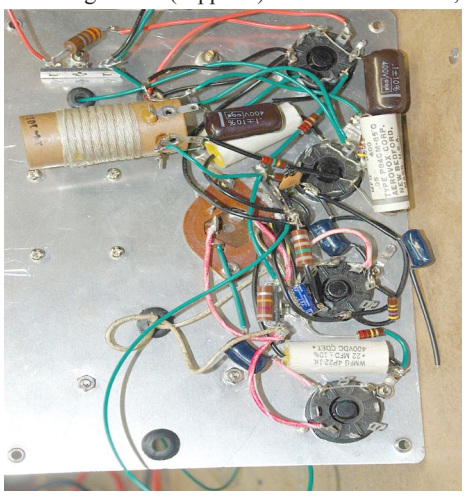
Now it was time for the moment of truth. Everything was checked over one last time. Power was applied … and nothing. All of the tubes lit up, but no audio was forthcoming. Upon rechecking, it was discovered that the tubes had been put in the wrong order. They had been reversed from the correct lineup. Once this was corrected, audio began coming from the speaker after warmup. Other than wrong tube order, everything else was correct.

It was now time for alignment. An antenna is required for good signal strength. I use a Grove beam antenna. A weak station at 1400 kHz was selected. Trimmer adjustments on the variable tuning capacitor were made for loudest audio.

Next, a station at the low end of the AM dial was chosen, around 670 kHz. The same adjustments as outlined above were made. This procedure was done several times until the loudest audio from both ends was obtained.

Next, the antenna coil was adjust for loudest audio on any station. Once this was completed, the "slug" was locked down by a supplied nut.

Final assembly consisted of mounting the chassis portion onto the plastic box base and installing screws (supplied) at each corner. Next,



the audio output / input was checked. An amplified iPod speaker was used for this test. Audio from the tuner came through loud and clear. Plugging the speaker in actually muted the audio to the radio speaker somewhat, an unexpected benefit.

Next, audio from the iPod itself was used as input to the radio. This worked quite well, coming out clear: Even though it was monophonic, the sound was quite pleasing to the ear. Volume is not controlled by the radio, but by the inputting device. Inputting audio also mutes the audio from the radio portion, but it is recommended that volume on the radio itself be turned down for best quality.

Final testing involved allowing the radio to play for several hours. No problems surfaced during this time or during additional testing with audio input and output.

It has been noted that this radio is a great performer, given its simple design. While it cannot stack up to the performance of a superheterodyne circuit, it still does a great job. It was recently shown to the doctor who recommended this for therapy, using just my finger on the antenna input for an antenna. Fortunately for us, his office is near the WGN transmitter, which came in loud and clear. Another patient in his office was quite curious about it and it was again demonstrated for her and the office staff.

All in all, I found this to be a great building and learning experience and highly recommend this project to anyone willing to take it on. At the least, it is a great conversation piece and a chance to "go retro" with an older but still venerable technology.

GLOBALNET

Exploring the World of Internet Radio and Television

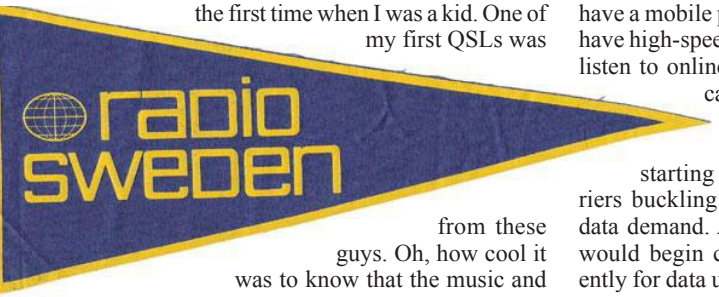
Loyd Van Horn, W4LVH
loydvanhorn@monitoringtimes.com

Internet vs. SW: Everyone's a Winner

Well, another one eats the digital dust. Radio Sweden has announced they will be terminating their shortwave and mediumwave broadcasts on October 31. From that date forward, all future programming will be conducted online. Upon reading that announcement, the internal battle began.

On days like this, I find myself torn between my nostalgic side and my more logical, technology-embracing side. That is not to say my nostalgic side completely lacks logic, but it does seem to be driven more by emotions than by common sense.

First, my nostalgic side chimed in. "Oh man, I remember listening to Radio Sweden for the first time when I was a kid. One of my first QSLs was from these guys. Oh, how cool it was to know that the music and discussion I was listening to was coming from half the world away." I was sad to see another long-time major broadcaster turn their transmitters off.



It was another sign of the world changing before my eyes.

Then my more logical side began to take over. "But this doesn't mean I will never get to hear them again. They will still be online for me to tune in whenever I want, no matter what the conditions are like. Plus, the money they will save from the millions of dollars they currently spend on broadcasting costs can be used to create an even better programming product online!"

The world is going to change whether we want it to or not; we can either embrace the change or be left on the side of the "information superhighway" with our thumbs in the air.

This is an ongoing battle we are going to be facing over the next few decades. Like it or not, technology has placed us in a situation where more and more broadcasters are going to be looking at their expenses and realizing the cost-savings by switching to an online-only service.

❖ The Pros and Cons

Before I begin my defense of broadcasters making the move, let me first recognize the short-comings of these actions.

First, I am fully aware that there are going to be millions of people in under-developed countries who are quickly losing their options for sources of information. These areas simply don't have the infrastructure to provide broadband Internet access to their people. Therefore, if all broadcasters go the way of Radio Sweden, where will they get their information? (To be fair, Radio Sweden will be keeping their local FM broadcasts alive, which means locals can still get their information there).

Secondly, I am fully aware that in many cases, you can't take the Internet with you. True, in the United States we are privileged in that we have a mobile phone network that enables us to have high-speed Internet access so that we may listen to online radio streaming anywhere we can get a signal.

However, even with our advanced networks, we are starting to see some of the major carriers buckling under the weight of increased data demand. AT&T recently announced they would begin charging new customers differently for data usage and that gone would be the days of truly unlimited Internet access. This would mean that users would be charged more for significant streaming usage. So even in the mighty U.S., mobile Internet access is becoming a more difficult venture.

Third, for those who listen as a hobby, I know that much of the joy and pleasure of tuning in distant signals is lost by simply clicking on a link on a web site. I have been a DXer for most of my life, and there is something magical about tuning a radio to a frequency and pulling elusive signals from the atmosphere. Simply put, many hobbyists have not and will not listen to programming over the Internet.

It is at this point that my logical side takes over.

To begin with, quite a few broadcasters have indeed turned their transmitters off or reduced their usage in favor of streaming. However, if you think we are heading for a day where there will no longer be shortwave or mediumwave broadcasts, you are mistaken.

Why is it that even though major broadcasters like Radio Sweden are turning digital-only, the shortwave bands seem more crowded? While large powerhouses are changing their focus to an Internet world, the door has been opened for smaller stations to flourish. In those same under-developed countries that don't have widespread Internet access, small local and regional shortwave broadcasters are now finally able to stretch their legs out a bit since the "big guns" are no longer taking up as much space.

The people who are screaming the most are the hobbyists – the pure, card-chasing DXers. While it is true that it is now harder to accumulate the easy catch of large powerhouse stations, you can still DX the smaller stations. I used to love listening to Central and South American stations in the tropical bands. These smaller stations I found to be a more rewarding catch than any of the large "flamethrower" broadcasters I had in my QSL book.

Still unsatisfied as a DXer? Try Amateur Radio. It is just as or perhaps more rewarding a chase than anything you have ever experienced in shortwave listening. The Amateur Radio HF bands are never going away, no matter what technology brings us. I have spent countless hours tuning the dials and fighting the atmosphere for elusive signals all around the world on my Icom HF transceiver, and I have the QSL cards to prove it. For those who lament the fact they may never be able to get Sweden verified on shortwave any more, there are thousands of ham radio operators in Sweden right now who would be more than happy to send you a QSL card.

Is your sadness not because you are a DXer, but because you enjoy the programming content of Radio Sweden and others? Well, guess what? You are in luck, because your favorite programs are still available online. Many stations even provide their programs in podcast format, so you can listen to your favorite show whether it is on the air or not!

Don't believe the hype, my radio friends. The sky isn't falling, shortwave isn't going to disappear, and Internet streaming isn't bringing down our hobby. There is still something out there for everyone; it just may not be where you left it last.

❖ Waiting for the iPhone 4

Last summer, as many of you know, I jumped the Verizon ship I had sailed with for nearly 10 years to align myself firmly in the Apple iPhone camp. The iPhone 3GS was simply a brilliant mix of computer and phone that forever changed how I function in my day-to-day life.

Many of those changes are well beyond the scope of this column, but the one that applies was mind-blowing to me. With great ease, I was able to tune in Internet radio streams from around the globe from virtually anywhere.

Tired of the same old morning show? I

was. So I replaced my local stations during my daily commute with BBC Radio Manchester, Sea FM in Australia, WWL-AM in New Orleans, stations in Canada, Ireland, Russia, Ghana, the Carribbean ... you get the point.

But, spoiling the delight of the iPhone as a streaming radio source, there was a glaring deficiency: no multitasking.

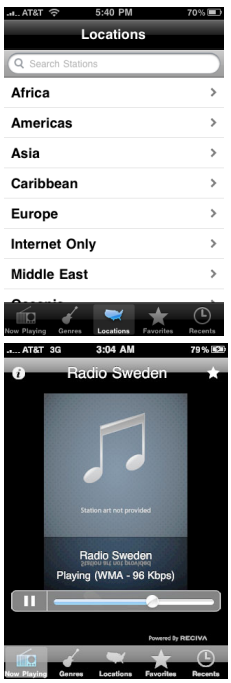
If I was enjoying a stream from RTE Gold in Ireland, but wanted to check my email while at a stop light, the stream wouldn't run in the background. Let's say there was a song I really liked and I wanted to know who the artist was. Normally, I would open up my SoundHound application, point the microphone towards the speakers and it would tell me. But, alas, when listening to a stream on my phone, I could not do both.

Oh, thank heavens for iOS4 and the new iPhone! While it doesn't support multitasking with every application, all signs point to the fact that most applications that run Internet radio will stream in the background while working in other applications.

I will not be able to upgrade to the new iPhone until February without spending an amount resembling the rent on my apartment. However, the good news is that the 3GS iPhone I am currently using will allow me to upgrade to the new version of the operating system, which is where the multitasking support will come from. So, expect a review of the new operating system in next month's column.

❖ *Finally,* Reciva has an app for that

I have been patiently waiting for Reciva, the leading stream source in the industry, to provide an application for the iOS devices (iPhone, iTouch, iPad, etc…). So far, a large number of third party applications that run RadioTime and other stream sources are all we have had to work with.



While good, they haven't nearly the number of stations as Reciva at their disposal. Besides, since I have a Reciva-enabled WiFi radio in my home, I have set up all of my favorite stations on the Reciva Web site. I didn't look forward to going through this process again for these other applications.

Well, now Reciva has put themselves in the streaming application dance, and not a moment too soon. With the new iOS4 being released in June that includes multitasking support, Reciva should be able to position themselves as one of the leading streaming radio sources for iOS device users.

The new application is easy to use, especially for any one who has experience using Reciva-based WiFi radios or the Reciva Web site.

You can browse stations several different ways (all displayed as icons on the bottom of the screen). You can browse by the hundreds of different genres available, by location (broken down by region and then by country), and you can access your favorites you have saved on the Reciva Web site (once you have registered your iPhone as an Internet radio on the Web site, a very simple process).

All told, the Reciva application is exactly what I have been hoping the company would release for quite some time. I would highly suggest all iOS device users to get on board with this application. It can be downloaded in the App Store for $3.99.

❖ GlobalNet Mailbag

Hello Loyd,

I enjoy reading your column-thanks. I have a question if you have a moment. I was looking for a portable device I could keep in my pocket and listen to internet audio streams (radio stations online) through headphones (ideally). You seem to recommend the Apple iPhone 3GS? I have an account at reciva.com where I have several radio stations I listen to-would that device and reciva website work?

I have a small portable Internet Radio IR518 that is wifi, but I am looking for something that can go beyond wifi hot spot range. Ideally, if the device had wifi capability and cell phone capability, it would be perfect. Can you recommend anything? (I recently purchased an ATT Pantech device: unless I am doing something wrong, nothing works. Audio streams don't load.) Thanks for your advice,

Best wishes, Bill - Sag Harbor, NY

Bill- As a user of the iPhone 3GS, I can tell you it definitely would suit your needs. From all indications, the new iPhone 4.0 looks like another amazing product, and the above-mentioned Reciva application should suit you fine, since you are an experienced Reciva user.

Any smartphone that allows the downloading of applications would work. I had great success using my old BlackBerry Curve to tune in Internet Radio broadcasts. I went with the iPhone because it allowed me to do a lot of things that the BlackBerry didn't allow (beyond Internet radio).

As to your ATT Pantech device, if you are not a current AT&T subscriber, you will be forced to abandon your current carrier and make the switch.

So far, the pocket-WiFi radio market is a bit limited, confined mainly to smartphones. In addition to iPhone and BlackBerry devices, HTC is a growing provider of such phones, though I have not had much experience with them to tell you how they would serve as an Internet radio device. (Is anyone out there using these phones yet?) Do some research and see which phone/carrier would fit best for you.

I haven't yet seen a Reciva application released an for BlackBerry or HTC, but even many of the third-party streaming apps use RadioTime, which is just as easy to use and has quite a few stations to choose from.

If you are a bit flexible with the pocket-sized parameters, you could also look at an iPad. This would allow you to have both the 3G/WiFi access without switching cellular providers or signing a contract (the cell signal option is a month-to-month option on the iPad).

Hope this helps you, Bill, or anyone looking to take the power of Internet radio with them!

Until next month, 73s!

GLOBALNET LINKS

Reciva.com - **https://www.reciva.com/**
Radio Sweden to halt shortwave broadcasts - **http://sverigesradio.se/cgi-bin/International/nyhetssidor/artikel.asp?nyheter=1&ProgramID=2054&Artikel=3600307**

What's NEW

Tell them you saw it in Monitoring Times

A Revolution is Coming Soon!

Many years ago, with the advent of trunking radio systems, P25 digital voice, and other technological advances, communications crossed a technological threshold beyond which many scanner hobbyists never dared venture, not even to continue listening to their local public safety agencies. Long gone from the vocabulary of the radio hobbyist were terms such as channels, banks, and the enter key; nor could they just punch in a frequency, hit the enter button and listen to local public safety communications. Because the communications had gone high tech, the radio monitoring hobby unfortunately had to go high tech as well.

In order to enjoy the scanning hobby, we've had to wrestle with programming concepts such as GRE's Object Oriented programming and Uniden's Dynamic Memory Allocation (DMA) scanners. We've had to learn about Motorola, EDACS and LTR trunk radio systems (3600 baud/9600 baud/ESK, etc.), P25 digital modulation, talk groups, NAC/DCS and PL tones, and all sorts of things that confuse and discourage many radio hobbyists.

Bar none, the most common complaint that radio hobbyists voice about modern scanner technology is that they are way too complicated to program and operate for the average Joe. You darn near need a college degree just to hear the local dog catcher!

I know that many of the readers of this magazine have lamented the fact that the difficulty of operating scanner equipment has been off the chart for several years now, and this has left many good scanner enthusiasts behind in the wake. In review after review of these scanners here in *MT,* we have documented that setting them up and monitoring isn't easy. We always recommended that you spent a lot of time with the owner's manual, and that you practice programming in the examples from those manuals to become familiar with using these technological marvels.

But all of this is about to change.

A major revolution in our hobby is on the way and it will forever change the very nature of the scanner radio hobby. On June 26, 2010, Uniden America held an open house at their corporate offices in Fort Worth, Texas, for the public and the media. At this open house they unveiled a new revolutionary scanner called the HomePatrol™.

So what is so revolutionary about this new scanner? Simply put, it is simplicity. There has never been one like it before. To say that it will be easy to program by the user is to totally understate the facts.

The only thing you will need to know to program a HomePatrol scanner is – wait for it – the Zip Code where you are currently located. Yes, you punch in your zip code on the LCD touch screen, press enter, and you will instantly start hearing local scanner communications (conventional and trunked, analog and digital). No other operator interface is needed and it is truly just that simple.

Maybe you don't want to monitor civilian or military air comms, just police, fire and EMS. No problem: touch the screen to set up what you want to hear and it is done. No banks, no systems, no groups, no programming of frequencies: your location is all you need to get you started.

If you are traveling and you have a GPS, plug that puppy into the HomePatrol scanner and it will ensure that your unit has up-to-date frequencies for the area you are traveling in. You don't have to do anything except to make sure that the GPS is working and plugged into the HomePatrol (the GPS unit is not included with the HomePatrol).

Now you see why we here at *MT* think that the Uniden HomePatrol has the potential to create a major revolution in the scanner world.

Unfortunately, we do not have enough space in this month's *What's New* column to go into detail, but you can see our exclusive first impressions on the HomePatrol on the *Monitoring Times* website at **www.monitoringtimes.com** or on my personal blog, the *BTown Monitoring Post* at **http://monitor-post.blogspot.com/**.

You can also visit Uniden's exclusive address for everything HomePatrol at **www.homepatrol.com/**.

Grove Enterprises will be selling the HomePatrol (SCN55). At presstime the price has not been set since the radio has not been type accepted. You can call 1-800-438-8155 and ask to be put on a waiting list for notification of pricing and availability when that is released. The projected availability date has been announced as October 1,2010. We will have a full *First Look* review of this revolutionary new scanner in the October issue of *Monitoring Times*.

Larry Van Horn, N5FPW

MFJ-844 SWR/Wattmeter Review

When we attach a transceiver or transmitter to an antenna line, we assume that all is well. After all, we hear signals, don't we?

The trick here is that a poorly impedance-matched antenna can still hear signals just fine as long as they are stronger than the background noise, but the same poor antenna system will cut down your transmitter's radiated power, wasting the power by heating the coax, making your signal weaker.

One of the greatest tools to reassure a ham that his or her rig is "getting out" is some indication of power output. Nothing does this better than an accurate wattmeter.

But, is that power going into an impedance-mismatched antenna so that reflected power is not being dissipated as heat in the coax? That's where a reliable standing wave ratio (SWR) meter comes in handy.

The MFJ-844 is a budget-priced, combination SWR/wattmeter designed to provide appropriate readings on the popular 144 and 432 MHz VHF/UHF ham bands. RF power up to 200 watts and SWR readings to at least 6:1 are indicated on the 2-1/4"-diagonal analog meter.

Its rugged metal, compact 3" square case invites unobtrusive mobile, portable, or fixed base application.

Low-loss SO-239 connectors assure no more than 0.3 dB insertion loss, and switchable 15, 50, and 200 watt meter ranges enhance accuracy. Another switch provides SWR/power selection.

The actual advertised frequency ranges for the MFJ-844 are 140-150 and 430-450 MHz. With my Yaesu FT-100D transceiver connected to the input, and a calibrated dummy load on the output, I ran the meter through multiple tests, band edge to band edge. It was easy to use and it performed flawlessly.

To check its accuracy, I performed the same power/SWR test with a laboratory Bird wattmeter to confirm the readings. They were very close – certainly close enough to validate the MFJ-844 readings.

The only limitation we could find with the unit is its restricted bandwidths. The frequency ranges stated above are quite accurate, although the meter does respond relatively well a few megahertz above and below those ranges.

It would be nice to have an inexpensive meter with wide, inclusive frequency coverage that worked on the 222 MHz band, perhaps including adjacent land mobile bands for wider applications.

But measuring wide spectrum on a single instrument is a tough assignment, so MFJ has chosen the two most popular VHF/UHF bands, and this certainly justifies the reasonable cost.

The MFJ-844 sells for $79.95 from Grove Enterprises and other *MT* advertisers. – *Bob Grove, W8JHD*

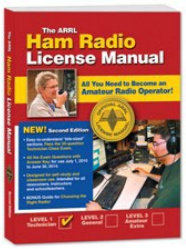
The ARRL Ham Radio License Manual, 2nd Edition

The amateur radio service offers a unique mix of technology, public service, convenience and fun. Some hams enjoy communicating across the country and around the globe, making new friends over the airwaves. Others like to build and experiment with electronics, experiencing cutting edge technologies. Some use their radios and skills

during emergencies or disasters when all else fails. And, today's ham radio gear offers possibilities for getting started at any level. Your first radio station might be at home, in the car, or small enough to take with you on the go.

In order to get in on the fun, you have to first get your ham radio license. If you want to get that ham ticket, then you have to pass the written exam. And one of the best products to use to study for that first ham exam is the new *ARRL Ham Radio License Manual*.

Use this book, and you will find it easy to pass the 35-question Technician license test. The book presents study material in easy-to-understand "bite-sized" sections. Every page presents information you will need to pass the exam and become an effective operator. It includes the latest question pool with answer key, for use beginning July 1, 2010. This new book is designed for self-study and for classroom use, and it is intended for all newcomers, instructors and schoolteachers.



The book covers the following topics:

- Radio and Signals Fundamentals (Radio Signals and Waves, Modulation, Radio Equipment Basics)
- Electricity, Components and Circuits
- Propagation, Antennas and Feed Lines
- Amateur Radio Equipment (Transmitters and Receivers, Digital Communications, Power Supplies and Batteries, RF Interference (RFI), RF Grounding)
- Communicating with Other hams (Contact Basics, Band Plans, Making Contacts, Using Repeaters, Nets, Emergency Communications, Special Activities, Modes and Techniques)
- Licensing Regulations and Operating Regulations
- Safety (Electrical Safety, RF Exposure, Mechanical Safety)

At the end of the book, you'll find the entire Technician question pool so you can be sure you're ready at exam time.

The most common question asked by new radio amateurs is, "Now that I have my license, what kind of radio should I get?" The ARRL, in an attempt to help newcomers to amateur radio answer that very question, has added a bonus supplement to the *ARRL Ham Radio License Manual*. "Choosing a Ham Radio: Your Guide to Selecting the Right Equipment" is aimed at the new Technician licensee ready to acquire a first radio, a licensee recently upgraded to General class and wanting to explore HF or someone getting back into amateur radio after a period of inactivity.

The guide features two main sections – one covering gear for the VHF and UHF bands, and one for HF band equipment, including a VHF/UHF and an HF glossary of terms you will encounter. The guide also urges you to discover just what you want to do with amateur radio and where you want to do it from. Do you want to be a "big gun" HF contester? Do you want to ragchew on your local repeater system? Maybe you want to join your local ARES® unit and help provide communications support in times of emergency. This guide will help you select the right rig for what you want to do.

"Choosing a Ham Radio: Your Guide to Selecting the Right Equipment" isn't a traditional "buyer's guide" with feature lists and prices for many radios. Manufacturer's Web sites and catalogs from radio stores have plenty of information on the latest models and features. As such, you won't find operating instructions or technical specifications here, but many manufacturers' websites will let you download brochures and manuals directly.

Second only to "What kind of radio should I get?" is "What kind of antenna do I need?" as the most common question asked by the new amateur. "Choosing a Ham Radio: Your Guide to Selecting the Right Equipment" talks about all kinds of antennas – from "rubber duckies" to verticals to dipoles to Yagis; it even explains rotators and antenna gain.

Power, filters, digital signal processing (DSP), as well as special features commonly found on VHF/UHF and HF radios are also included in the guide. ARRL members who are logged on to the ARRL website can view the guide online at the ARRL website.

All in all, this license manual is the most popular introduction to amateur radio. The *ARRL Ham Radio License Manual* is your ticket to joining the ranks of ham radio operators.

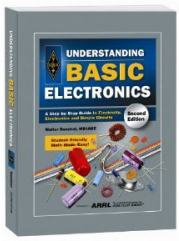
This second edition ARRL product number 0830 cost $24.95 plus shipping.

Understanding Basic Electronics, 2nd Edition

By Walter Banzhaf, WB1ANE

This new second edition of *Understand Basic Electronics* is a step-by-step guide to electricity, electronics and simple circuits.

This book is written in a friendly, easy-to-understand style that beginners and nontechnical readers will enjoy. Even if you already have a foundation in basic electronics, you will enjoy the small module format of each chapter – allowing readers to digest (or skim) "bite-sized" chunks of learning material. Real-world examples and clear illustrations make the study of electronics interesting and fun. A handful of small "kitchen table" projects are included to help bring abstract concepts to life.



The book covers the following topics:

- Electronics – What is it Good For?
- Analog and Digital Electronic Circuits
- Electrical Terms: Voltage and Current
- Conductors, Insulators and Resistors
- Electricity and Magnetism
- Capacitors and Inductors
- Electrical Circuits – Series and Parallel
- Ohm's Law
- How to Solve Circuit Problems – Some Techniques and Tricks
- Energy and Power
- What is Alternating Current (AC)?
- Transformers
- Impedance
- Resonant Circuits
- Active Device Concepts: Semiconductors, Diodes, Transistors and ICs

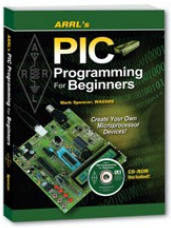
This is an excellent reference book for students with basic math skills (add, subtract, multiply and divide); and radio amateurs and experimenters interested in gaining a more complete understanding of basic electronic principles. You should use this book before you begin studying more complicated tutorials.

This second edition ARRL product, number 0823, costs $32.95 plus shipping.

ARRL's PIC Programming for Beginners

By Mark Spencer, WA8SME

This book teaches you the language of microcontrollers. Microcontrollers control virtually everything we use in our everyday lives, from microwave ovens, remote controls, heating thermostats, entertainment systems, and clocks, to electronic tooth brushes. In recent years, radio amateurs have become interested in the extraordinary potential of microcontrollers as tools in everything from station accessories to transceivers. As a result, they're eager to learn how to program these devices and actively put them to work.



ARRL's PIC Programming for Beginners is an introductory guide to understanding PIC design and development. Written in a building block approach, this book provides readers a strong foundation on the subject. As you explore the potential of these powerful devices, you'll find that working with PICs is simple, educational and most importantly fun.

There is a CD-ROM included with programming resources, supplementary reading, short video clips and other helpful data.

This book is based on a limited vocabulary of the 35 instruction set in assembly language that is recognized by Microchip's MPASM□ Assembler. The programming language used in the book is assembly language. Also, The PIC Programming kit mentioned in the book is under consideration but is not presently available. The prototyping hardware (board and parts) addressed in this book is not available from ARRL. A list of parts, part numbers, and suppliers is included with the book.

This second edition ARRL product, number 0892, costs $44.95 plus shipping.

You can order all ARRL publications from the ARRL, 225 Main Street, Newington, CT 06111-1494. Order Hotline 1-888-277-5289 (toll-free US only), Monday through Friday, 8am to 8pm Eastern time. You can also order online at **www.arrl.org**.

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

ICOM IC-R6 Hand-Held, Wideband Scanner

by Bob Grove

There's a big difference between conventional VHF/UHF "police scanners" and wide-frequency-coverage, hand-held, scanning receivers. The newly-released ICOM IC-R6 is an excellent example of the latter.

VHF/UHF scanners typically receive only above 30 MHz (occasionally 25 MHz), and in the FM mode for land mobile stations, WFM for FM broadcasters, and AM for aircraft, both military and civilian. They emphasize fast scanning rates, the ability to search for unknown signals, and banks of memory channels for quick recall (fire, police, medical, aircraft, etc.).

Wide-frequency hand-helds, on the other hand, begin at much lower frequencies, typically 100 kHz, in order to include low frequencies in the domestic AM broadcast band as well as international broadcasters throughout the high frequency (shortwave) spectrum.

They also include the VHF/UHF range, but typically don't scan or search as fast as the VHF/UHF-only scanners, nor are they likely to have as many memory channels, although most recent entries have an adequate supply.

A first look at the IC-R6

It's compact, about the size of a pack of unfiltered cigarettes (remember those?), measuring only 3-1/4"W x 3-1/2"H x 1-1/8"D. The small size is accompanied by the solid feel of just under a half-pound of weight.

A 7" rubber whip antenna extends from an SMA connector on the top panel, allowing for alternative antenna attachments. Optional SMA-to-BNC adapters are available from most scanner dealers.

Alongside the antenna are a rubber-flap-protected earphone/speaker jack and a rotary function control which works in combination with four multifunction keys.

The alphanumeric LCD display is busy and very informative, confirming the many functions described below, as well as a choice of alpha identification or frequency on any channel. Its five-second backlight makes it easy to read in subdued ambient lighting conditions.

The display includes a useful S-meter, a 12-segment LCD bar graph which really does change proportionally with received signal strengths.

A wall-wart AC/DC power supply/charger is included; it can power the radio as well as charge the two AA NiMH cells that come with it. An optional desk charger can be purchased, providing a convenient, upright mounting base for the scanner while it's charging the batteries.

Also available as an option is a cigarette-lighter power adapter which allows the radio to be operated from, or charged by, the required 4.5-6.3 VDC. Current drain with the backlight off is 130 mA while receiving a signal, down to 65 mA on standby, or even 30 mA in the power save mode.

A sturdy belt clip is provided, as is the expected wrist lanyard.

Architecturally, the circuit is a triple-conversion superheterodyne, standard for the industry, with intermediate frequencies of 266.7 MHz, 19.65 MHz (FM/AM), and 450 kHz (FM/AM).

Sensitivity is specified as 0.89 microvolts AM at shortwave frequencies, and 0.18 microvolts FM at VHF/UHF (slightly less sensitive at high UHF).

The Manual

The 82 page operating manual is well written and easy to follow. The contents graduate logically, first introducing the instrument's keys, display and options, then evolves into specific operational instructions. It concludes with several pages of worldwide frequency allocations for general reference.

Frequency coverage is continuous from 100 kHz to 1310 MHz, excluding 822-851 and 867-896 MHz, a little wider than the U.S.-prohibited cellular telephone frequencies.

There is no numeric keypad; frequency selection is done by pressing the BAND key repeatedly to step to the appropriate part of the spectrum, then rotating the control knob up or down in frequency.

Initial, factory-set band-step frequencies are 1.62, 5, 51, 76, 118, 146, 370, 440, 850, and 1295 MHz. Modes are automatically assigned as appropriate for each band. When the user slews away from those initial frequencies, the last frequency tuned in any band is memorized and becomes the initial frequency the next time the band key selects that band.

One of the band positions is NOAA weather, allowing the tuning dial to step through the seven standard NOAA channels plus three marine weather frequencies.

Fine frequency resolution as well as step sizes can be selected from 5, 6.25, 8.33, 9, 10, 12.5, 15, 20, 25, 30, 50, 100, 125, and 200 kHz. Holding the FUNC(tion) key while rotating the dial permits rapid 1 MHz stepping to more rapidly slew through the spectrum.

Four multifunction keys select (in order): (1) band, keypad lock, memory channel name; (2) tuning step, set (to select alternative user-chosen functions), up/down arrow-key assignment; (3) mode, scan type, DTCS/CTCSS scan; and (4) VFO/memory, memory write, channel skip.

Two rubberized side keys are used to (1) activate alternative actions of the multifunction keys, and (2) defeat the squelch to listen to the displayed frequency or channel.

1300 memory channels store the listener's favorite frequencies.

Audio

One of the concerns brought about by small radios is their small speakers. But the R6 maintained good fidelity with minimal distortion clear up to its maximum speaker output. At normal listening volumes, voice audio was crisp and clean.

Since virtually all monitoring with any scanner is for voice communications, it's not unexpected that music reproduction at full volume on the R6's little speaker sounds a bit "screechy."

Set Mode

Perhaps the most powerful key in the pad is the one marked "SET." In this display mode, the user can select options as follows:

1. Step size for the rapid slewing with the tuning dial; 0.1, 1 or 10 MHz.
2. Priority watch for an active channel with or without a "beep."
3. Key-touch beep on/off.
4. Beep level, 0-40.
5. Display backlight: always off, on for 5 seconds, always on.
6. Power saver reduces battery current drain by cycling its activity.
7. Antenna selection: External (SMA jack), internal AM bar, earphone cable.
8. Key lock for all functions, or individually allowing volume, squelch adjustment.
9. Dial speed automatically selects larger steps when turned rapidly.
10. Monitor switch may become push on/push off instead of push/release only.
11. Auto power off shuts down radio 30, 60, 90, or 120 minutes without activity.
12. Scan resume after 0-5 seconds or holds after signal disappears.
13. Scan stop beep.

14. Frequency offset allows SQL key to shift to the input frequency of a repeater.
15. Duplex direction shifts up or down from the memory frequency.
16. Tone squelch selects CTCSS tone squelch or DTCS digital squelch.
17. Tone frequency for either CTCSS or DTCS selected from standard table.
18. DTCS polarity is chosen between normal and reverse.
19. Voice squelch stops scanning for only 1 second on active frequencies with no voice.
20. Program bank link unites banks to scan sequentially.
21. Change program link name (custom), like "HAM," "FIRE," "POL," etc.
22. LCD contrast sets from 1-5 (light to black).
23. Weather alert on/off.
24. AF filter suppresses high-pitch tones (on/off).
25. Charge permits selection of continuous battery trickle charge or 15 hour limit.
26. CIV baud rate, address, and transceiver.

❖ And then some

Data cloning is readily accessible between two of the same model receivers using the optional CS-R6 software, prepared for Windows© 2000/XP/Vista/7.

PC control of the receiver is effected through an RS-232 link using an optional CT-17 CI-V level converter; however, Icom does not supply the software program. The data format and command set are provided in the manual.

❖ Let's check it out

The first consideration upon the receipt of any battery-operated device is the charge state of the battery supply. Charging with the R6 is a bit of a ritual. With the two AA cells inserted in the radio and the charger connected, NiMH N (for no) should be seen on the display, indicating that the nickel-metal hydride cells are not being charged.

The user must rotate the function dial to show NiMH Y (for yes) on the display, then push the BAND key which now returns the display to NiMH N, so the user must then rotate the dial again to show NiMH Y which initiates the charge. If he doesn't do that within 10 seconds, the owner must remove the batteries from the radio and start all over again.

It seems to us that if the user plugs an external power cord into a radio, he means to do it and shouldn't have to select a number of confirmational options. Still, the ritual becomes routine with practice.

Similarly, the presence of four multi-level buttons to execute a wide variety of functions may seem confusing at first, but the operating manual is one of the best we've seen in its step-by-step explanations. Soon it all begins to make sense and, keeping in mind that most of the commands will be for initial setup of the R6, there really aren't all that many to have to remember in order to keep you going.

❖ Sensitivity

The design of a scanner with high sensitivity and immunity to strong-signal overload is a daunting task to say the least. The two demands simply do not go well together. Such design requires a remarkable degree of linearity in all of its circuits (wide dynamic range); this translates to big bucks.

Scanner and portable shortwave manufacturers have learned to implement an attenuator option which allows the listener to decrease the receiver's amplification in strong-signal environments.

There's yet another factor that must be considered: the whip antenna. No whip can provide uniform response over a wide frequency range. The little "rubber duckies" that come with scanners do well on some frequencies, but not so well on others.

Thus, in spite of uniformly-sensitive engineering of the scanner, it will appear hot on some frequency ranges and somewhat deaf on others. Changing whips merely shifts the hot and cold spots.

In general, the little R6 performed well with its stock antenna.

A note should be made here about what appears to be poor specified sensitivity on shortwave AM broadcasts. At these frequencies, atmospheric and environmental electrical noise is high, and a signal must be relatively strong to stand out above those noise sources. Thus, sensitivity at these frequencies is not as critical.

With such a short antenna, tailored to the VHF/UHF spectrum, shortwave reception is limited to the strongest AM international broadcast signals, few in number during daytime; much more prevalent at night. An external antenna is immeasurably better, but that compromises the pocket portability of such a small receiver. This is where the earphone cord antenna would help.

❖ Selectivity

The ability of a receiver to discriminate between two closely-spaced signals is important, especially if they are both strong. The R6 does a decent job separating AM broadcasters and FM communicators, but on FM broadcasting (WFM), it's broad as a barn – about 2 MHz wide, typical of pocket scanners.

But how many of us buy a wideband pocket portable scanner to listen to FM broadcasting? It's there as a matter of convenience, not FM DXing for weak-signal reception.

❖ Scanning Speed

We all want a scanner that instantly finds an active channel, once the traffic on the present frequency stops. But there are limits to how fast a scanner can recombine its algorithms to compose new frequencies, while also allowing all circuits to come up to optimum.

When scanners first came out, typical scan rates were on the order of six channels per second, but that wasn't bad, because there weren't that many channels provided! Now, with 1000 or more memory channels typical, it's far more of an issue.

We clocked the channel step speed at 100 per second – not bad at all. And the 1300 memory channel capacity can be assigned among 22 banks.

❖ Spurious Signals

We found the R6 to be pleasingly free from internally-generated spurs, intermodulation and imaging over the frequencies we tested using the whip antenna.

❖ Voice Squelch

One of the most irritating annoyances in scanning is having a scan sequence hang up on noise, data bursts, and other non-voice transmissions. The R6 has a voice squelch option which will resume scanning in one second if voice patterns aren't detected.

❖ So what doesn't it do?

Even though the R6 covers shortwave, it doesn't have single-sideband mode for monitoring two-way voice communications.

The lack of direct-entry keys requires a cruder way of dialing in a frequency.

Lack of trunk tracking or P-25 decoding limits its use for VHF/UHF public safety monitoring in many locales.

❖ The bottom line

The recently released ICOM IC-R6 is a handy, easy to use, functionally flexible, well designed, pocket scanning receiver at low cost for monitoring non-trunked VHF/UHF radio systems, military and civilian aircraft, marine communications, and international and domestic broadcasting.

The Icom IC-R6 (SCN24) is available from Grove Enterprises for $199.95 plus shipping and handling. You can order online at **www.grove-ent.com** or by calling the toll-free order line at 800-438-8155.

LETTERS

editor@monitoringtimes.com

This column is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be edited or shortened for clarity and length. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902 or email editor@monitoringtimes.com

Happy monitoring!

Rachel Baughn, Editor

Rachel Baughn
rachelbaughn@monitoringtimes.com

Putting a Face on *MT*

First, thank you so very much for the superb and responsible job you do as long-time editor of *Monitoring Times* magazine for which I have been a long, long time subscriber. I am writing you to thank and congratulate whoever finally decided what a great idea it would be to put the picture of each columnist at the heading of their particular column, and particularly in *color,* as it so adds being able to identify the writer. It's kind of like going from no TV, to Black & White TV, and finally to Color TV. While some pictures are brighter and clearer than others, they are still a world away from no pictures…

I also would like to make very positive mention of the March 2010, page 62-63 *Antenna Topics* article by Mike Frye titled: "Build this UHF omni Satcom Antenna: Part 1." Fascinating and exceptionally well presented. The pictures of the various satellite receiving antennas are worth a lot of words of text, anytime...

Please tell Bob Grove, Mike Frye and, last but certainly not least by any stretch of the imagination, Larry Van Horn (a definite, long time Treasure of the publication), a hearty greeting and appreciation for being there!

Jack Thurston

SAR: *Sesta Antes do Rescue?*

Tom Estabrooks wrote to Ken Reitz: I realize that the main point of your [May *Communications*] article was to mention the EP1RB system. However in the interest of accuracy, I would like to point out that the ship *Concordia* was Canadian based (Lunenburg, NS). At least 42 of the students were Canadian.

The real story at the time of the event, was the slowness of Brazilian authorities to conduct SAR. They were in lifeboats for 40 hours before being picked up by merchant ships.

Of course the Brazilian Navy blamed the captain for not following certain rules as they sailed in Brazilian waters.

Tom Estabrooks VE1TJE, Halifax, NS

Mourning *Passport*

Ever since I started in this hobby, *Passport to World band Radio* has been a real Bible to me. To see this publication go away is like looking at a bright comet in the sky that passes by and might not come back again.

EDITOR'S SOAPBOX

Uniden Open House

by Larry Van Horn
MT Assistant Editor

There was a major radio hobby event that occurred on June 26, 2010, in Fort Worth, Texas. Uniden America conducted their first public open house at their corporate headquarters in conjunction with the release of a revolutionary new scanner product – the HomePatrol™ scanner (see the What's New column in this issue of MT).

Uniden officials felt that this new scanner was revolutionary enough that they paid for the travel and lodging of a limited number of key industry representatives to show them their new model and, just as important, to get the impressions of their guests before the first production run.

Paul Opitz, Uniden's product manager, unveiled the new scanner during the open house which drew more than 140 people to the event. Uniden had enough units and experts in the room to allow small groups of radio hobbyists an opportunity to spend some hands-on time with the new HomePatrol scanner. Some of the experts for that session were also guest speakers at the event. They included Lindsey Blanton, owner of RadioReference.com; Tom Swisher, Popular Communications magazine scanner columnist; Norm Schrein, editor of National Scanning, and me, Larry Van Horn, representing Monitoring Times magazine.

Uniden Open House Early Crowd shot – Early arrivals to Uniden's Open House pour over literature to learn about the new HomePatrol scanner. (Photo by Larry Van Horn)

In addition to the barbecue lunch provided by Uniden, there were T-shirts and other goodies given away to participants who attended the event.

What is refreshing about all of this is the commitment that Uniden has made, not only to their new product, but also to the radio hobby in general. They were willing to spend money during tight economic times to not only share information on their new product, but also to allow time for others in the industry to speak with the radio hobby community. Bottom line, it was a real class act, and Paul Opitz and the entire Uniden America team deserves to take a bow for conducting this fine event.

Uniden has come a long way from the early days of the Bearcat crystal scanner to become a leader in the radio scanning hobby. They have led the way in innovation with the first trunk tracker scanner, the first P25 digital decoding scanner, dynamic allocation memory that did away with the banks and channel restrictions of older scanners … and now they have found a way to make scanner programming and control much easier.

Uniden Open House Blanton – RadioReference.com President Lindsey Blanton briefs members of the media and Uniden team on the role his website will play in HomePatrol. (Photo by Larry Van Horn)

They were also the first scanner company to employ testing teams to make sure that they got it right before the radio went out the door. But, I think the best part of their approach to marketing is they have listened to their customers and have incorporated customer input into new products to really advance the radio listening hobby over the last few years.

To all the team at Uniden and Uniden America, Bravo Zulu (a Navy term for a job well done); we here at Monitoring Times wish you great success in your new radio venture.

About a month ago, I went in a local book store and asked for the latest issue of the book. The gentlemen told me that they had none … Coming out of the elevator at the next level of the store, I glimpsed something familiar. Hidden (yes, hidden) on the wrong shelf, there it was: a copy of the 2009 issue of *Passport*. It seemed as if someone had hidden the book with the intention to buy it later.

It was a strange feeling. I felt like a little boy that finds a nice toy he was looking for. I paid for the book and went home.

Thanks to Larry Magne for all these years with a fine publication.

Hector NP4FW

KAAY: One for the books

[Bud Stacey wrote "The Wild Life and Times of KAAY" for the February 2010 issue.]

Well, "it" has happened! When I was doing some research, I found that the *Encyclopedia of Arkansas* had only one entry, and that was of an old TV station back from 1927! I asked, "Why not KAAY?" and they asked if I'd be willing to write them an encyclopedic entry. I assured them I would...and three months later, they contacted me for my address! I've received, signed and returned the Authors Agreement today and am doing research immediately!

I'll use some factual material from the *Monitoring Times* article, with credit to same, of course, as well as other sources. The bad thing about this is that I have to *not* use a lot of enthusiasm! It has to read like it came from an encyclopedia...and how can one NOT be enthusiastic about one of the most influential stations in the country, much less this hemisphere!?

Bud Stacey

Both Sides of the Microphone

I have already received a lot of positive comments about the article [*SW Radio from Both Sides of the Microphone*, June 2010] from around the world. For example, a listener wrote from Pennsylvania to request a program schedule, and Risto Vahakainu of the Finnish DX Association wrote to ask me if he could translate the article into Finnish and publish it in their club magazine!

Again, thanks so much for your interest, and I hope the article will spark some extra interest in shortwave, and inspire some who are already SWLs to keep the hobby and medium alive!

Jeff White, WRMI Radio Miami International

NASB Announces Shortwave Listener Survey

Jeff White is president of the National Association of SW Broadcasters, which has posted an International Shortwave Survey. The purpose of the survey is to gather demographic information about shortwave listeners in North America and around the world, and to find out about their preferences in terms of programming, radio receivers and much more.

Everyone who completes the survey is invited to submit their e-mail address if they would like to receive a free subscription to the NASB Newsletter, published electronically several times per year.

The survey will be online for one year, and the results will be made public at the 2011 NASB Annual Meeting on the Royal Caribbean Majesty of the Seas cruise ship May 13-16, 2011.

The link to the survey is: **www.surveymonkey.com/s/6LRVLJ7** For more information on the NASB cruise, go to **www.shortwave.org** and click on "Annual Meeting."

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Columnist Blogs and Web Sites

These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.

AMERICAN BANDSCAN
http://americanbandscan.blogspot.com/ - by Doug Smith

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

SCANNING REPORT
http://www.signalharbor.com/ - by Dan Veeneman

SHORTWAVE
http://mt-shortwave.blogspot.com/- by Gayle Van Horn

UTILITY WORLD
http://mt-utility.blogspot.com/- by Hugh Stegman
www.ominous-valve.com/uteworld.html

Looking for Writers

MT is soliciting feature articles, reviews, and how-to articles covering shortwave broadcasting, utilities, scanning, frequency profiles, construction projects or whatever excites you! Contact Feature Editor Ken Reitz at *kenreitz@monitoringtimes.com* or write c/o Monitoring Times, 7540 Hwy 64 West, Brasstown, NC 28902.

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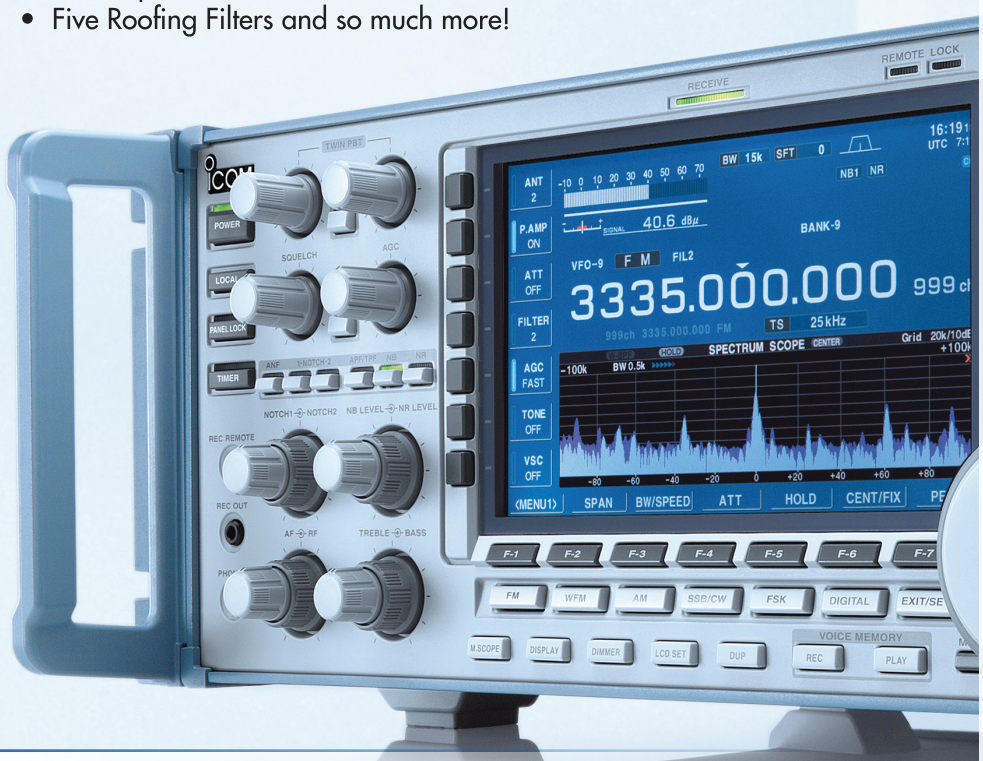

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